Model Engineer

THE MAGAZINE FOR THE MECHANICALLY MINDED

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ONE SHILLING 24 OCTOBER 1957 VOL 117 NO 2944

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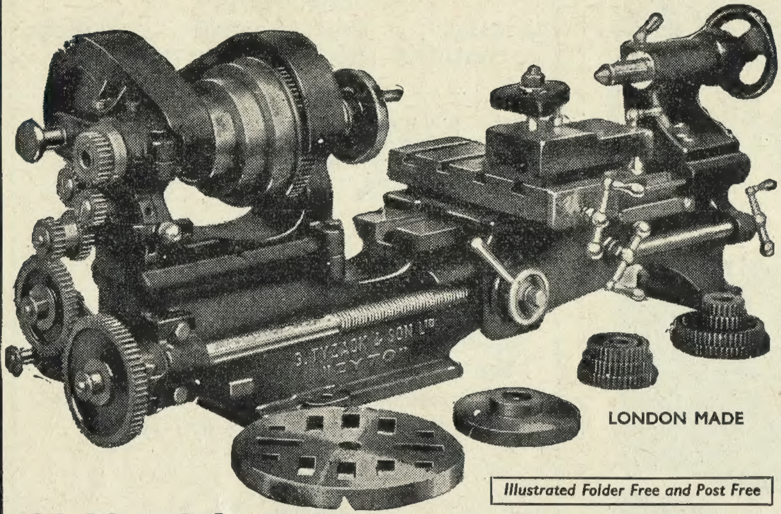

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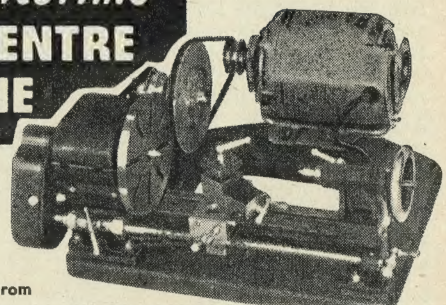

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Model Engineer

ONE SHILLING 24 OCTOBER 1957 VOL. 117 NO 2944

Published every Thursday Subscription 58s. 6d. (USA and Canada $8.50) post free

In this issue

Next week

The regattas

Model power boat propulsion. A new series by Mr Westbury dealing with power units and transmission

An American Virginia

Live steam in OOO gauge Mr Sherwood, of Australia, builder of the smallest locomotive in the world, describes his model

½ in. capacity drill from scrap

Smoke Rings

A WEEKLY COMMENTARY BY VULCAN

MANY readers would have been among the crowds who went aboard the four-mast barque *Pamir* when she last visited London in 1948—was it as long ago as that? All will be grieved to hear of her tragic loss and will, I feel sure, join in sympathy for the bereaved ones and for the country which has lost so many promising youths from her Merchant Marine.

The *Pamir* was a big, powerful ship, strongly built to the highest standards. When she was in London I went aloft to photograph details of her rigging and gear, and was struck by the strength and general good condition. But the forces which are unleashed in a hurricane are quite unpredictable, and *Pamir* is not the first ship to be dismasted under such conditions.

Was deck torn up?

Perhaps the deck was torn up when her foremast went, or it may be that the hatch covers gave way. The hatches were usually reinforced by heavy timbers for a passage round the Horn, but such provision may not have been considered necessary for merely crossing the Atlantic. It was usually reckoned that so long as her hatches and decks were intact the sailing ship could go through almost anything.

There has been considerable comment in the newspapers about the use of sailing ships for training, one writer even going as far as to say, "It is questionable whether such ships should be used on ocean crossings as they are apparently unable to cope with inclement weather."

This is obviously incorrect, especially when one remembers the centuries during which such ships, and mostly smaller and less powerful ones, have been making such crossings.

Influence of models

A PARAGRAPH in a London newspaper states that next season all sixteen yachts in the International One-design class in the Royal Corinthian Yacht Club will have synthetic sails. Quoting Mr Alan Burrough, the vice-commodore, it states:

"In future you will stand no chance unless you use sails made of terylene, nylon or dacron."

It is a few years ago since a similar remark was made to me concerning model yachts—I believe it was at the 10-rater MYA national Championship at Birkenhead in 1955—to the effect that "one cannot win championships now-a-days with cotton sails." Cotton sails are now a rarity on model yachts and it is gratifying to see that owners of full-size yachts are taking notice.

I have already referred in this page [13 December 1956] to the yachtsman's interest in the vane steering gear. At the National Boat Show last winter

Smoke Rings . . .

I saw Uffa Fox examining a vane gear which was being discussed with him by two of our leading model yachtsmen.

A few weeks ago the Amateur Yacht Research Society sent me one of their recent pamphlets on self-steering in which a variety of vane gears were illustrated, some of which were based very definitely on the vane gear developed by the model yachting fraternity.

Helping the children

EVERY summer the model engineering movement, through its passenger-carrying locomotives, gives pleasure to tens of thousands of children. In Britain, the Commonwealth and the USA portable and permanent tracks are immensely popular. The wiser local authorities recognise that a track in a park or similar public place can be a valuable amenity.

All this is admirable, but I wonder if the model engineering clubs have ever thought of what their skill might do for children in the school playground? In England we have brought colour and light into the schools and erected buildings which are remarkable examples of modern architecture. Sometimes, on the outside, there is an even more remarkable example of modern sculpture, usually from a famous studio. There is nothing else; only bare, unadventurous asphalt and concrete, relieved at best by a few prim flowers.

The children are given activity-periods to develop their innate constructional instincts, but at break-time when their imaginations could be even more freely occupied they have absolutely nothing constructional to engage their natural high spirits.

Abstract on concrete

At one school an expensive piece of abstract sculpture is serving a solidly practical purpose which I am sure that the sculptor, whom I know and saw at work on it, never contemplated for a moment; the children climb over it and crawl through those lop-sided holes without which no sculpture can hope to be considered contemporary!

All our efforts to give the children a better education and a freer school life are mocked by these barren playgrounds. One day something may be done, but in the meantime here, surely, is a chance for model engineers.

What children delight in are constructions which they can climb over and in or, better still, set in simple motion. They need ups and downs, corners and curves. Even a tree on the ground will give them scope for adventure. As the construction need not resemble anything at all (any more than an abstract sculpture) the builder can give his own imagination full play in making it.

Any modelling club which undertakes to provide "something for the kids" in the school playground is sure to earn the gratitude of children, teachers and parents alike; and the club, in turn, will have the goodwill of a new generation as an asset for its own future.

Playground constructions are not a luxury. We must remember that most schoolchildren of today, for all the advantages that they enjoy, are unable to play with simple things such as hoops because of road dangers and other restrictions—including the amount of glass in the schools. Give them a safe, interesting construction in the playground and their imaginations will turn it into anything from a Wild West express to an atomic spaceship.

I wonder what the clubs, or the unattached modellers, think of this suggestion.

View of the PAMIR *when she was in the Thames in* 1948

Cover picture

Two views of the steam tug built by A. Beaumont, of King's Lynn. Upper picture shows a deck view of the model; the one below is a shot of the bows.

Bouquet from a beginner

IN the attempt to assist the newcomer to model construction it is not always easy to strike the happy medium between the crudely simple and the too elaborate type of model. The choice of subjects which will interest inexperienced readers without being beyond their limited skill and facilities is a rather narrow one, as it is most essential that however simple the model is it should be a genuine exercise in design and construction and, above all, worth while making.

No doubt some of the efforts made by the ME to carry out this policy have fallen short of the mark, but it is worthy of mention that the special requirements of the beginner are always under consideration.

It is good to know that some of the articles written for the reader making his first approach to model work bear forth good fruit, and are duly appreciated. Among many recent testimonials to this effect I quote the following:

"Recently I completed the simple steam engine, Theseus. Thank you so much for the introduction to steam in such a simple fashion. I know this simple design only touches the fringe of the subject, but in my case it has served the purpose for which it was designed. The steam engine is no longer a mystery. The fact that it actually works gives me encouragement to go on to something more advanced."

A 4-4-0 TENDER ENGINE FOR BEGINNERS

The ME gauge 1 steam locomotive

By MARTIN EVANS

This is the first article in a series which will describe an easily constructed spirit-fired locomotive

THIS 4-4-0 locomotive is of particular interest as its design is basically one of J. N. Maskelyne's dating back to 1924, though opportunity has been taken to bring certain parts, such as ports and valves, more into line with current practice. I have named it *Newbury* in recognition of J.N.M.'s association with that town.

Though free-lance, the design has a Southern flavour, and is straightforward and reasonably easy to build.

Methylated spirit firing is used, the boiler being of the usual high-pressure water-tube type, and the few castings required will be obtainable from our advertisers. A simple displacement lubricator, located between the frames ahead of the smokebox, should cope with the oil supply, and water feed will be taken care of by a hand pump in the tender.

All wheels are sprung, the driving wheels by single coil springs, and the bogie will have a simple form of laminated springing. No horns are specified, the frames, of $\frac{1}{16}$ in. thickness being sufficient for normal wear. So now to work.

MAINFRAMES

These are cut from $12\frac{1}{2}$ in. lengths of $\frac{1}{16}$ in. bright mild steel, $1\frac{1}{4}$ in. wide. One strip is marked out from the drawing, all holes drilled, and the marked strip bolted or riveted temporarily to the second strip for cutting out together.

The slots for the main axleboxes should be sawn and filed, using a piece of $\frac{1}{2}$ in. square brass bar (later to be used for axleboxes) as a gauge.

Only one frame stretcher is required and this is simply a $1\frac{5}{16}$ in. length of $\frac{1}{4}$ in. dia. b.m.s. drilled No 37 both ends, and tapped 5 BA.

The buffer beam and drag beam are cut from $\frac{1}{2}$ in. × $\frac{1}{2}$ in. × $\frac{1}{16}$ in. hard brass angle. Drill buffer holes No 21, and tap $\frac{3}{16}$ in. × 40 t.p.i. The 3/32 in. square hole for coupling is cut by first drilling with No 41 drill, then opening out with a small square needle file.

Coming now to the slots for the frames, these can be cut by means of a metal fretsaw (jeweller's type) with No M/O blade, two cuts being made to each slot, as near as possible to the scribed lines, finishing off with a flat needle file, using the frames themselves as a gauge.

The buffer-beam fixing angles are merely short lengths of $\frac{5}{16}$ in. × $\frac{5}{16}$ in. × $\frac{1}{16}$ in. brass angle riveted to the beam with $\frac{1}{16}$ in. copper rivets, and 6 BA steel cheesehead screws are used through No 34 holes in the frames into tapped holes in the angles.

The mainframes may now be assembled, a toolmaker's small clamp being used to hold the frames in position for drilling.

A hand drill is quite satisfactory for this, one hole being drilled and tapped without shifting the clamp. When all holes are drilled and tapped the frames should be placed on the surface plate or lathe bed for final assembly.

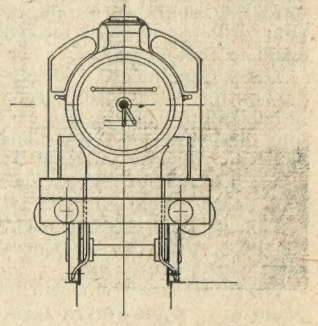
AXLEBOXES

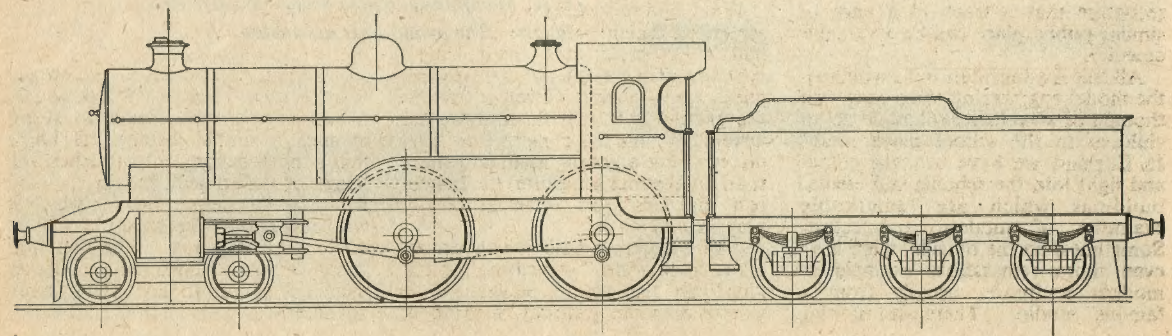
As few constructors will have a milling machine available, a built-up axlebox is suggested, $\frac{1}{2}$ in. square brass bar being used and $\frac{1}{16}$ in. strip of suitable width to form the flange. Chuck sufficient $\frac{1}{2}$ in. square bar in the four-jaw, set to run true, centre, drill and open out to about 9/32 in. Part off to length ($\frac{3}{16}$ in.).

If a micrometer is available, measure the width of the parting tool, add the 0.187 in. to this. Set the topslide reading to zero, move the saddle along until the parting tool just touches the face of the bar, and clamp the saddle.

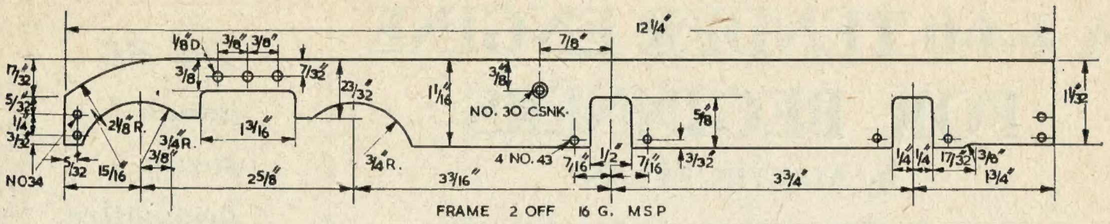
Now move the topslide by 0.187 in. plus the width of your tool, and the tool will be set exactly right for the parting operation. Repeat the process for each axlebox.

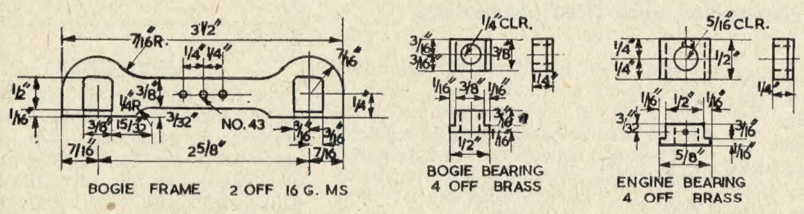
Lay the four boxes on your strip





Front and side elevations of the ME gauge 1 steam locomotive





Details of the frames and axleboxes. The hole for the spring pin is tapped 8 BA on the underside of the axlebox

of $\frac{1}{16}$ in. brass, which should be previously tinned, with about $\frac{1}{4}$ in. between each box, then solder up. Saw off each box, leaving sufficient to form the flange, and finish off with the file.

The flanges should be finally secured by drilling and tapping 10 BA halfway through (from the flanged side) and screwing in tightly a couple of brass screws, any type of head, cutting off the excess and cleaning up flush.

Now drill right through the axlebox, using the same drill as before, finally opening out to $\frac{5}{16}$ in. Drill No 50 and tap 8 BA for the spring pin, and run your drill (or reamer) through once again to remove burrs.

The springpins are $\frac{7}{8}$ in. lengths of 3/32 in. dia. silver steel, turned down at one end to 0.089 in. dia. × 3/32 in. long, and threaded 8 BA. The other end being directly threaded 7 BA for a length of 9/32 in. Screw the springpins tightly home into the axleboxes —if they should protrude slightly into the bore, they can be trimmed off flush with a needle file.

The springs are wound with 0.019 in. piano wire, a mandrel of 3/32 in. dia. silver steel being used in the lathe for this purpose. When not under compression the springs should measure about $\frac{11}{16}$ in. long.

WHEELS

Having tried several different ways of machining wheels, I am inclined to think that our friend LBSC's usual method is as good as any, so kick off by chucking each wheel casting in the three-jaw, back outwards, and face right across with a round-nose tool set crosswise in the toolholder.

Check the thickness of the casting at this stage, with calipers or rule, as it is advisable not to leave too much metal to be turned off the front or the spokes will come out too close to the rim.

Centre, drill and ream $\frac{1}{4}$ in. dia. for the drivers, and $\frac{3}{16}$ in. for bogie and tender; if no reamers are available, use a letter D drill immediately before the $\frac{1}{4}$ in. drill, and No 13 before the $\frac{3}{16}$ in. drill. Lightly countersink the axle holes at the back of wheel.

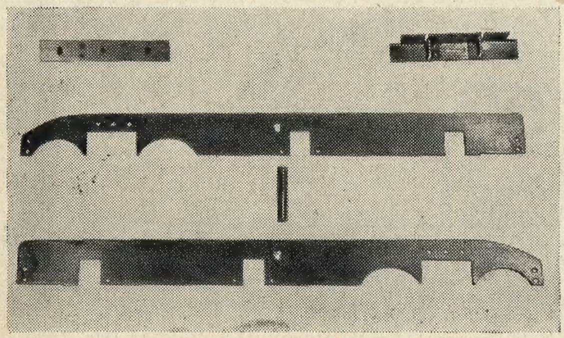
Complete this first operation on all wheels before starting the second.

For turning the tread, flange and rim, a suitable casting is used, such as a disc wheel, small chuck backplate or even a large cylinder cover. For the drivers, the outside diameter of this casting (after machining) would be about $2\frac{7}{16}$ in., and $1\frac{5}{16}$ in. dia. for the tender wheels. The same casting can be used for the bogie wheels by turning another $\frac{1}{8}$ in. or so off the outside.

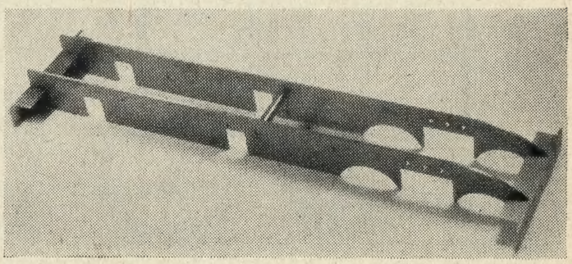
Rough turn the casting all over, in the three-jaw, and for the driving wheels, centre, drill, and force in a short length of $\frac{5}{16}$ in. dia. ($\frac{1}{4}$ in. for bogie and tender) b.m.s. rod. Turn this down until the wheels are a nice sliding fit on it, without shake, and thread the end $\frac{1}{4}$ in. BSF (bogie and tender 2 BA). The drivers can now be mounted in turn, face outwards, and held tight against the casting by a nut and washer.

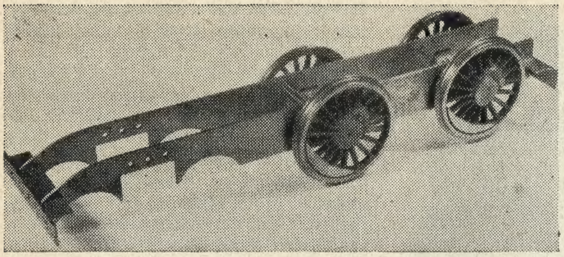
Incidentally, it is a good plan to slightly relieve the face of the "back-plate" for the inner 1 in. dia. or so, in order that the wheel may bear only by its outer diameter, and not by its boss. However, should the wheels tend to slip under the pressure of the turning tool, this is easily cured by fitting a small screw to the "back-plate" coming through the spokes of the wheel.

The rim and balance weight may be machined with the tool set roughly at



Left: Mainframes, buffer beams and stretcher
Below: The mainframes assembled





45 deg. to the wheel, and by noting the setting of the topslide (the saddle being locked to the bed) all wheels will come out exactly the same thickness.

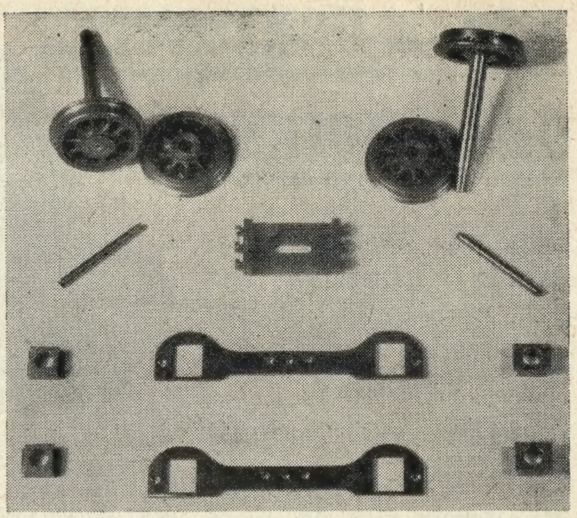
To turn the flange and tread, set the tool so that its left-hand side is at a small angle (say 10 deg.) to the wheel and the correct contour of flange will then be produced. The radius between the flange and tread will be determined, of course, by the radius of the tip of the tool, a suitable radius for gauge 1 wheels being about 1/32 in.

By noting the readings of the topslide and cross slide (or by the position of the handwheels) all wheels should come out identical. Round off the flanges with a file (*with* handle on !)

The final operation—to machine the boss of the wheel—can be done by chucking the wheel directly in the three-jaw. Don't chuck too tightly or the flanges will be marked. Free the saddle, bring up the tool until it just touches the rim of the wheel, clamp the saddle again, then bring the topslide back 0.062 in. and the setting will give the correct thickness for all the wheels.

The next job is to drill the driving wheels for the crankpins. Make a simple drill jig out of a short length

Above: Wheels and axles fitted to the mainframes



Right: The bogie parts—frames, axleboxes, axles, wheels and stretchers

of b.m.s. bar, about $\frac{1}{2}$ in. × $\frac{1}{4}$ in. section, drill two holes No 34 to start with, exactly 13/32 in. apart, open one hole out to No 32 and the other to a press fit for $\frac{1}{4}$ in. (letter D drill) and countersink both holes (60 deg. countersink if available).

A short piece of $\frac{1}{4}$ in. dia. silver steel is pressed into the jig, standing out a distance of about 9/32 in. The jig can now be clamped to each driving wheel in turn, being lined up with the crank, and the No 32 drill run through both jig and wheel. Remove the jig and follow up with a No 31 drill, when the wheels will be ready for the crankpins.

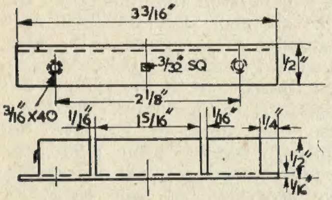
AXLES

The axles are turned from $\frac{5}{16}$ in. dia. round ground mild steel ($\frac{1}{4}$ in. dia. for bogie and tender), being held in a collet if available. If the three-jaw chuck is used, check for truth before commencing turning and, if necessary, pack out with a strip of brown paper until the bar runs true.

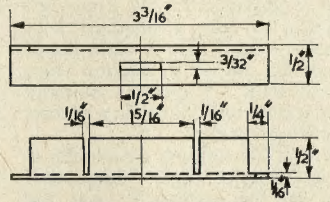
I prefer to turn both ends of each axle in turn, to bring them to the correct overall length first. It is then an easy matter to use the topslide to obtain the exact length of wheel-seat. It is also not a bad plan to set the topslide to turn very slightly taper (not more than $\frac{1}{2}$ deg.). Start by turning the wheel-seats to 0.002 in. oversize, measured in the middle of same, then try a wheel on, and take a further very fine cut, if necessary.

It should be possible to push the wheel on by hand about halfway if the turning is correct.

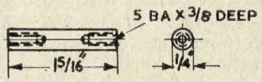
●*Continued on page 593*



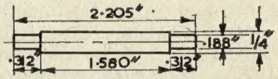
FRONT BUFFER BEAM I OFF BRASS



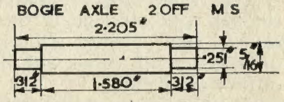
DRAG BEAM I OFF BRASS



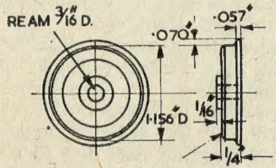
FRAME STRETCHER I OFF MS



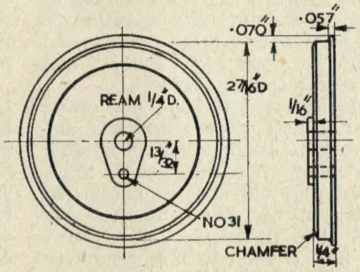
BOGIE AXLE 2 OFF MS



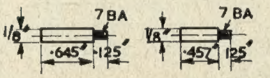
DRIVING AND COUPLED AXLE MS



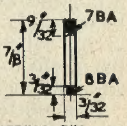
BOGIE WHEEL 4 OFF



DRIVING AND COUPLED WHEEL 4 OFF

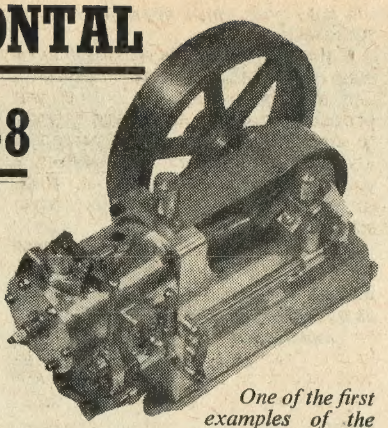


CRANKPIN SILVER ST.



SPRING PIN 4 OFF SILVER ST.

A 60 c.c. HORIZONTAL GAS ENGINE—8



One of the first examples of the Centaur to be built by a reader, an all-fabricated version by Byron G. Barnard

Edgar T. Westbury discusses carburation and the machining of the carburettor body in this instalment

Continued from 10 October 1957, pages 503 to 505

In keeping with the general principle of making this engine as versatile and adaptable as possible, a special carburettor has been designed capable of working either on gas, petrol or paraffin.

There are, however, many constructors who will prefer to make other arrangements in this respect, either to save trouble or to satisfy their own preferences. It may be said that the engine will run on almost any type of carburettor or gas-mixing device, though the results obtained may possibly be affected by the limitations of the particular design.

Good carburation is essential to the success and efficiency of any type of engine, and whether one decides to use a ready-made carburettor, such as that used on a cycle motor, or a plain "mixing tube," as fitted to miniature glow plug or c.i. engines, it will need to be correctly adjusted to suit the engine's requirements.

An engine will run on gas with no more elaborate equipment than a gas tap fitted to the induction pipe—and many users have expressed satisfaction with the results attained—but it is an extremely crude arrangement, and the lack of any automatic quality control of the mixture may render starting difficult. This objection applies also to liquid fuel carburettors of the simpler types, though in these cases speed control is most affected, as the mixture strength varies with the degree of throttle opening.

If any modification of carburettor arrangements is made, it will probably be necessary to alter the port-face side of the cylinder head to comply with the means of attaching the carburettor and exhaust pipe.

It is practicable to counterbore and tap the ports to take screwed connections, the bore of which should not be less than that of the gas passage in either case. An alternative method of fixing separate inlet and exhaust pipes, which does not entail altering the cylinder head, is to provide collars on the ends of the pipes and secure them with a double-ended fork clamp, such as was often used on some early car engines; the two fixing studs may be located as specified on the drawing.

These variations from the set design are mentioned because it is my experience that the majority of constructors like to exercise their own ideas or whims in some details of design, and strict adherence to blueprint in every detail is the exception rather than the rule.

If, however, the carburettor is made specially—to the general design shown here—there is still some latitude in respect of details; in cases where only one kind of fuel is to be used, certain parts may be omitted. Running on gas is provided for by a screwed connection to take a standard $\frac{1}{8}$ in. gas cock or stop valve, while liquid fuels are fed, either by suction from the base tank or from a suitably located gravity tank, through a needle-controlled jet orifice.

Provision for running on paraffin is made by using a single "manifold" casting for the carburettor and the exhaust branch, the latter serving as a hot-spot to prevent deposition of the heavy fuel without heating the mixture so much as to rarefy it and thus reduce engine efficiency.

This feature has been introduced at the request of many readers; the engine will certainly run on paraffin when once warmed up, and the lower cost of this fuel may be considered to justify its use, but it produces less power than petrol, and is a rather dirty fuel, tending to produce greasy carbon in the engine and exhaust system, and also acting as an anti-lubricant, which increases the rate of cylinder and piston wear.

It may be added that an engine can be made to run on practically any combustible fuel at a pinch, and exhaustive experiments were made to explore these possibilities in the early days of development, but whether the saving of fuel cost compensates for the disadvantages of low grade fuel is another matter.

CONSTRUCTION

In machining the carburettor body, it is advisable first to hold the casting in the four-jaw chuck and machine the bolting face; beyond getting this reasonably parallel to the faceplate no elaborate setting up is necessary as it does not have to be centralised. The exhaust passage is cored, and the inlet passage need not be considered at this stage. The remaining major operations can be carried out by mounting the casting on an angle plate, with a slip of paper under the machined face and clamps over the side lugs.

In this position the vertical axis of the throttle housing can be centred, and after machining the top flange face it is centre drilled, bored and counterbored as specified. It is best, however, not to attempt drilling right through to produce the lower valve guide, as there is a risk of the small drill running out of truth in this considerable depth.

A more prudent course is to drill and bore out the valve chamber and throttle housing to finished or roughed-out dimensions, and then use a small centre drill or rigid spearpoint drill to spot the centre at the base of the chamber before drilling and reaming the $\frac{1}{8}$ in. hole.

It will be seen that the lower end of the chamber is in the form of a rectangular bridge piece, $\frac{3}{8}$ in. wide, and when the chamber is bored $\frac{9}{16}$ in. dia. it breaks out at the sides of this bridge to form the air inlet apertures. These may need to be filed out slightly to remove knife edges and provide an adequate area of opening.

No provision has been made for controlling intake of air by a shutter or choke plate on this carburettor, but it could be modified to incorporate this if thought desirable.

The most delicate machining operation on this casting—though not really difficult—is the formation of the grooved valve seating. It can be first turned to the included angle of 90 deg. by setting over the topslide to 45 deg. after which a small round-nosed boring tool is used to form the groove, the topslide being swung to 45 deg. in the other direction to

enable the tool to feed in squarely with the face of the seating.

The casting is reversed end for end to face the exhaust flange, and in the interests of accuracy it is a good policy to carry out the drilling operations for the horizontal fuel and air passages in the lathe set up in this way as well. It is, perhaps, a little more tedious to centre these positions accurately than to locate them in the drilling machine, but it does ensure that the holes are exactly where you want them and that they proceed in the right direction; the necessary spot facing operations are also more likely to be clean and accurate.

The induction passage should, preferably, be left slightly undersize at first for boring or reaming afterwards with the throttle barrel *in situ*.

Both ends of the jet passage are tapped $\frac{3}{16}$ in. × 40 t.p.i., taking care to ensure that the threads are truly in line with the axis, and the gas inlet tapped to take a standard fitting. Holes are drilled from the groove in the valve seating to connect with the fuel passages, that on the jet side being No 60 and the other 3/32 in. dia. In localities where gas pressure in the mains is liable to be low, it may be found desirable to drill two or more holes in the seating for gas admission.

THROTTLE BARREL AND COVER

The barrel should be made of material definitely harder than the housing, and resistant to corrosion. It is machined all over, care being taken to get the outer diameters concentric with each other and also with the $\frac{1}{8}$ in. central hole. The counterbore is not so important, and may be machined at a second operation in the self-centring chuck, and the fit of the barrel in the bore should be on the easy side, with smooth working surfaces.

If desired, the side aperture may be marked out with the barrel in position, and drilled separately, but it will probably be found easier and quicker to clamp it in place after machining and fitting the cover by inserting a packing ring or washer $\frac{1}{8}$ in. thick under it and tightening the cover screws.

The hole may then be "followed through" from the induction passage, but do not attempt to drill it full size at once or a heavy burr will be formed which will seize the barrel immovably in the housing. It is better to drill well undersize at first and open out by reaming or boring both holes together.

The cover is a straightforward job as the essential surfaces of the flange, spigot and centre hole can all be machined at one setting, and the top side only needs cleaning up. It is then drilled for the four fixing screws, the tapping holes for which can be spotted through into the body casting. The throttle lever is a simple component which calls for no special comment as the only essential requirement is that it should fit the stem of the barrel neatly and clamp securely in place.

AIR VALVE

The air valve must also be made of hard-wearing and non-rusting material, and it may either be machined entirely from the solid or fitted with a pressed-in stem, preferably of stainless steel.

The essential thing is that the seating and stem should be true with each other, and when assembled—with the barrel and cover in position—it should be quite free and drop truly on to its seating. Any stickiness or tight spots would be fatal. Avoid the temptation to correct misalignment by running a reamer right through from the stem of the barrel in to the bottom guide as the result of this would probably be to gouge the latter out of truth with the seating.

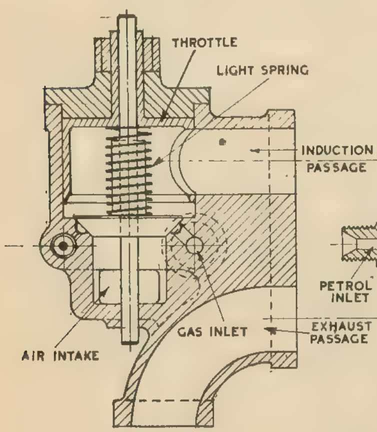
The spring on the valve should only be just sufficiently strong to close it positively; too strong a spring will impose a restriction on the air flow and limit engine performance, and will also cause noisy action. In many cases it will be found that the weight of the valve alone is sufficient to close it by gravity, but a light spring does assist in lifting the fuel from the base tank, especially under starting conditions.

The valve does not need to be ground in to the seating, but its fit should be checked by using marking colour and, if anything, it should bear slightly harder on the lower "land" of the seating than the upper.

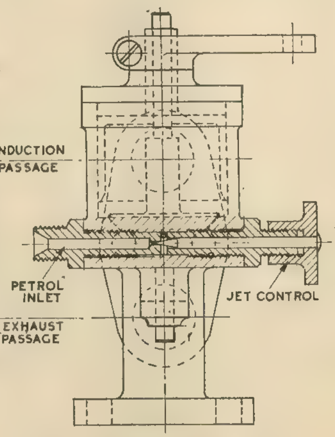
JET COMPONENTS

The jet components are simple, but need to be accurately machined to preserve concentricity and alignment. The jet body should have the long end machined first, including the shoulder, spigot and threaded part, the orifice being drilled No 60 at the same setting and slightly countersunk with the point of a hand graver, square centre, or other tool which can be relied upon not to chatter or throw up a burr.

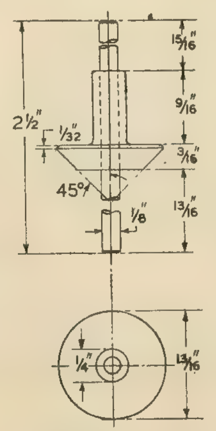
A tapped chucking piece is then used to hold the piece in the reverse position for screwing, coning out with a centre drill, and drilling a $\frac{1}{16}$ in. hole to join up with the jet orifice. This part is, of course, intended for connecting up the fuel pipe by a standard union nut and nipple; it has not been considered necessary to show detailed drawings of these items as they are, or should be, fully understood by readers and



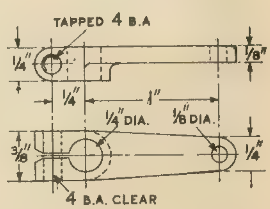
CARBURETTOR



GENERAL ARRANGEMENT



LIFT VALVE 1 OFF
BRONZE WITH STEEL STEM



THROTTLE LEVER
1 OFF BRASS

can be bought ready-made if required.

Procedure in machining the needle guide is much the same as for the previous part, but in this case the $\frac{1}{16}$ in. hole is drilled truly right through, and when re-chucking for turning the outer end care must be taken to see that this hole runs dead truly. The spigot on the inner end of each part should fit closely in the centre of the bore in the body, being intended to provide positive *vis-à-vis* alignment of the two parts, the end faces of which should be not more than about $\frac{1}{16}$ in. apart.

The knurled jet screw should be drilled, counterbored and tapped concentrically, and the fit of the thread on the end of the guide should be easy enough to enable it to run freely down to its full depth. After turning the outside, knurling or serrating the edge, and parting off, the other side is faced and the hole countersunk to form a capillary well for the solder used to attach the needle. (Index marks and numbers on the face are helpful for verifying jet settings.)

Do not cut the needle to length at first as it can be adjusted in position and cut off as required. A simple way of forming the point accurately in cases where precision collets are not available is to improvise a simple fixed steady from a piece of hardwood held in the lathe tool post and drilled $\frac{1}{16}$ in. dia. from the chuck while in this position.

A piece of $\frac{1}{16}$ in. stainless steel rod two or three inches long is then held in the chuck, with the extended end running in the hole in the wood. Pare away the wood until almost exposing the needle, then file away *both the wood and metal* at the required angle while running the lathe at top speed.

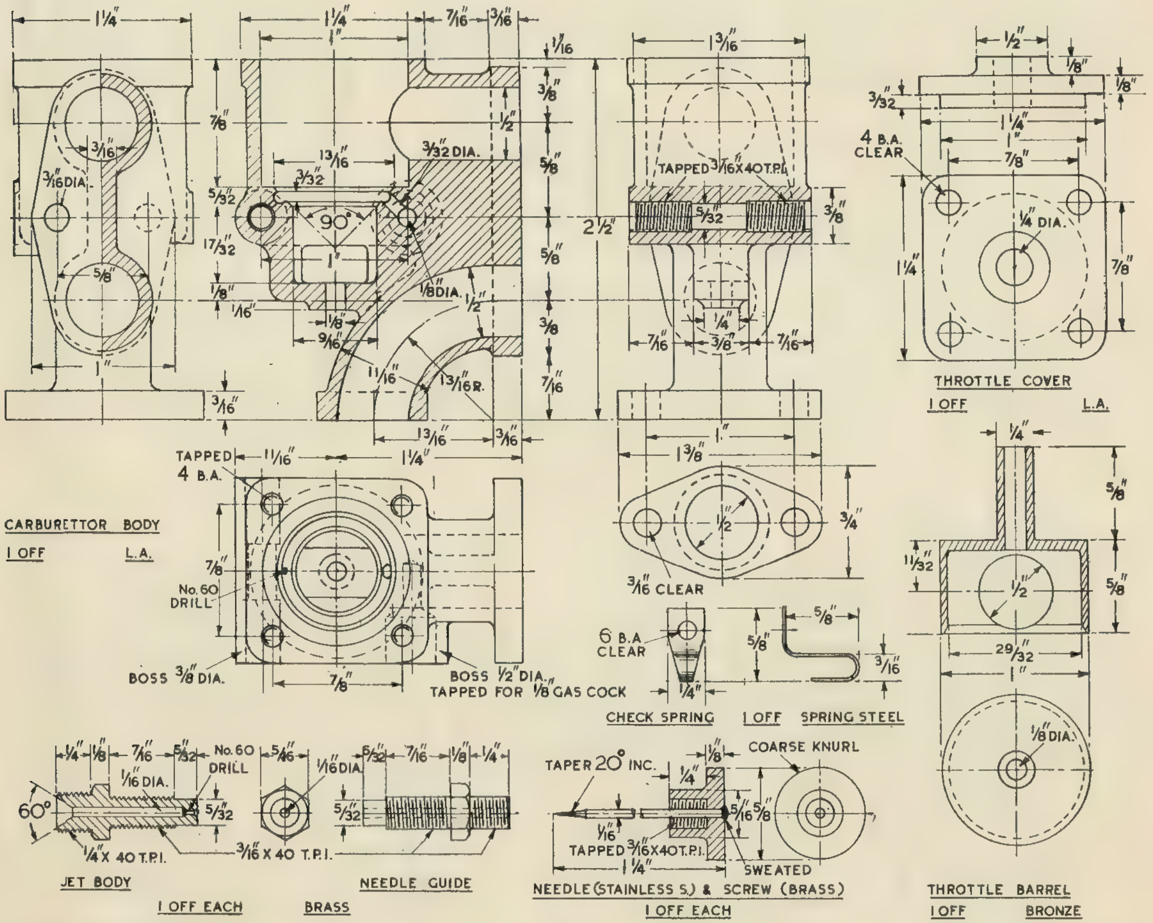
A superfine Swiss pivot file (such as shown by Kennion Brothers at the ME Exhibition) should be used for finishing the point; the angle, by the way, is not critical, but too obtuse a point will render fine jet control difficult.

With the jet assembly in position the knurled head is screwed on as far as it will go, then backed out about one turn and the needle pushed right home in the jet orifice. The exact length can thus be assessed, and the needle cut off slightly proud of the face. It can also be sweated in position, using either a blowpipe flame or a soldering bit large enough to supply adequate heat, but before doing so the needle should be removed and the end tinned to ensure that it does not rely on the blob of solder on the end to hold it.

Some readers find difficulty in soldering stainless steel, but I think the main reason for this is that because the surface is bright they assume it does not need cleaning. This is a fallacy, for there is actually a protective chemical film on the surface which must be removed with fine emery cloth immediately before soldering.

There are special fluxes for soldering stainless steel, but I have not found them necessary as the normal zinc chloride flux, or solder paint, takes

●*Continued on page 593*



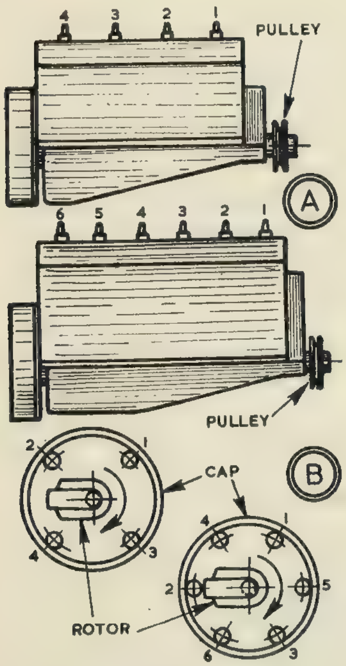
MULTI-CYLINDER IGNITION

By GEOMETER

To sort out mixed-up sparking plug leads, to remove and fit a distributor, to time an engine, or to discover its firing order, are all straightforward enough when the quite simple principles of multi-cylinder engine layout and ignition are understood.

The four-stroke cycle requires two revolutions of the crankshaft for one firing stroke—and in these two revolutions, the camshaft operating the valves and the contact breaker cam initiating the spark for each firing stroke, each make one revolution.

In a multi-cylinder engine all cylinders fire once in two revolutions, and in the popular four-cylinder and six-cylinder engines the crankshafts are arranged for firing strokes to occur at uniform intervals. Thus to produce the number of sparks required the contact breaker cam of a four-cylinder engine has four " lifts " or

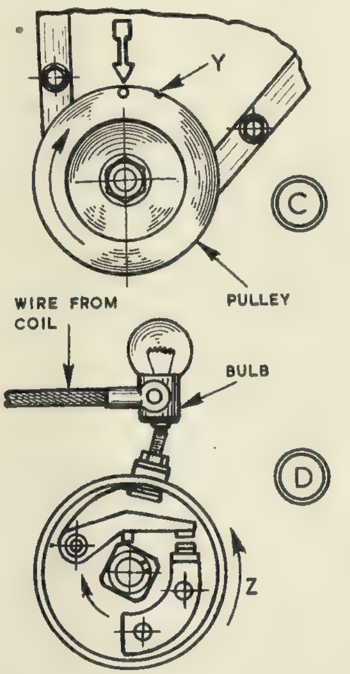


corners like a square nut—while the cam of a six-cylinder engine has six lifts or corners, like a hexagon nut.

On each lift of the cam operating the contact breaker, a spark is produced at the coil. It must then be directed towards the cylinder on the firing stroke. This is effected by an insulated rotor with a metal segment, turning at the same speed as the cam, inside a cap round whose periphery at appropriate intervals are electrodes from which wires go to the sparking plugs.

The metal segment on the rotor is fed with sparks from the central lead in the cap, supplied from the coil.

Cylinders of in-line engines, as at



A, are usually numbered front to back, and fire in a certain order, beginning with No 1. For four-cylinder engines, the common firing order is 1, 3, 4, 2, and for six-cylinder engines 1, 5, 3, 6, 2, 4. These are at *B* on the distributor caps.

Some engines, however, have the reverse firing order of 1, 2, 4, 3, and 1, 4, 2, 6, 3, 5—seen to be the reverse way round the caps.

To avoid mixing leads, each terminal end should be nicked with a file or scratches can be made on the cap. Nicks should not be cut in the leads or shorts may occur.

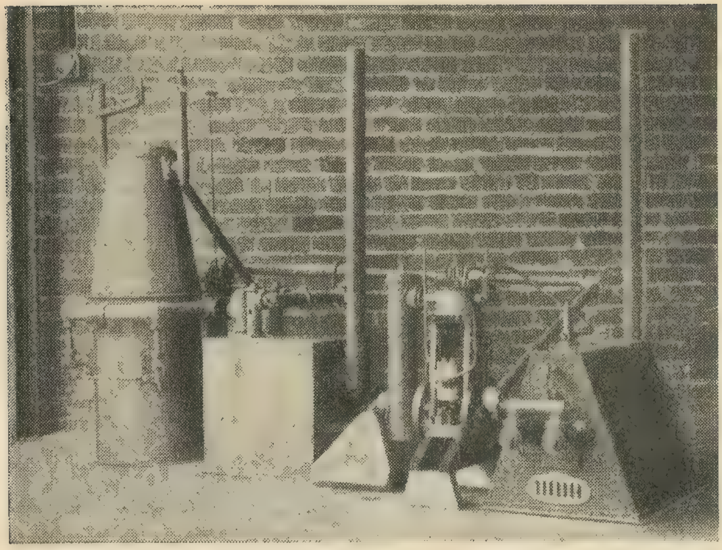
When leads cannot be identified, t.d.c. No 1 firing stroke should be found. Next remove the sparking plug, place a thumb in the hole and rotate the engine until compression is felt, then the piston is brought to t.d.c.—watching with a flashlight, feeling with a wire, or checking on the crankshaft pulley, as at *C*. The rotor is then feeding No 1 plug wire, and the others round the cap go to the cylinders in the firing order of the engine.

This principle is adopted in timing when a gear on the distributor engages the camshaft. No 1 firing stroke t.d.c. is found, and the distributor engaged (allowing for twist of the helical teeth) with points just opening and the rotor feeding No 1 plug wire. A tongue-and-groove, or dog drive, involves no problem, however, as both are off-set, and the distributor can only be fitted one way.

Lacking the firing order the valves must be checked, as all inlets or exhausts move in that order. Observing adjacent pairs of valves the exhaust closes and the inlet immediately opens. Wiping off oil, all inlet springs can be marked with chalk, then, starting at No 1, the order of inlet opening can be verified.

Usually a distributor is mounted by a plate with a clamp fixed by a setscrew. If this is removed the fine setting is preserved. The setscrew hole may be slotted for fine adjustment or the distributor may have micrometer screw adjustment. If not, the clamp screw can be slackened for fine setting.

At No 1 t.d.c. or the advance position, as at *C-Y*, with the ignition switched on, the wire is removed at the distributor. A bulb is held in circuit, as at *D*, and the distributor is moved back then forward, as *Z*, until the light goes out. ■



A model BLAST FURNACE PLANT

"Etna Junior" — now, alas, no more — was built by Michigan reader R. V. Hutchinson. Here is his account

UNTIL fairly recently numbers of large lumbering operations in the north central United States have included saw mills, wood distillation plants. small blast furnaces and farms.

The scrap wood, roots, branches, mill slabs and sawdust were treated in kilns to recover numerous chemicals, and the remaining charcoal, after cooling, became fuel for blast furnace use. The products of the furnace were pig iron, slag and flue dust, and because of the high quality of both fuel and selected ore, the resulting iron long commanded premium prices.

The temperature at which the slag flowed freely when molten was relatively low, enabling its ready conversion to heat-insulating material. The flue dust obtained when certain ores were used was an excellent potato fertiliser, so at times a potato farm was an integral part of the works.

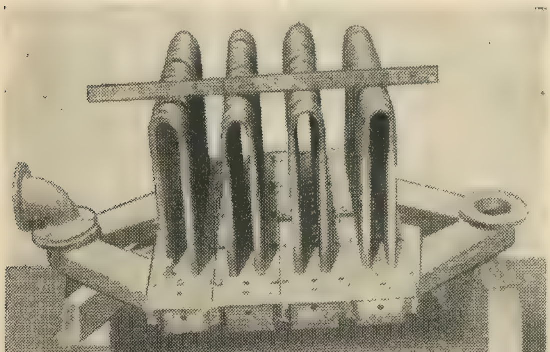
Such a typical operation was the Antrim Iron Company, whose plant was about 130 miles north of Grand Rapids, Michigan, and which for some sixty-five years made and marketed lumber, chemicals, pig iron, slag and seed potatoes. Shortly after the second world war its operation was abandoned and the plant dismantled.

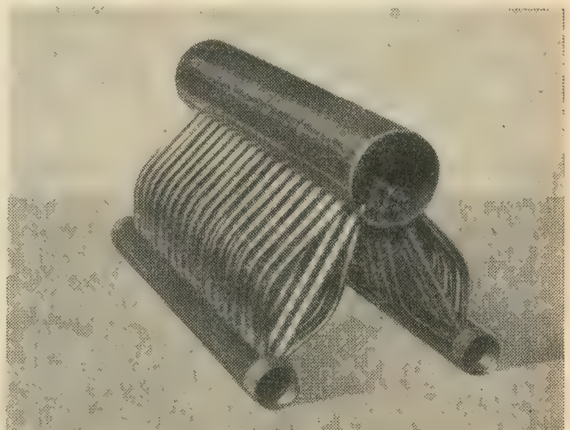
Toward the end costs of assembling the raw materials had become excessive—and the last straw may well have been the development of synthesis of methyl alcohols. This new process certainly did not help the wood-distillation business.

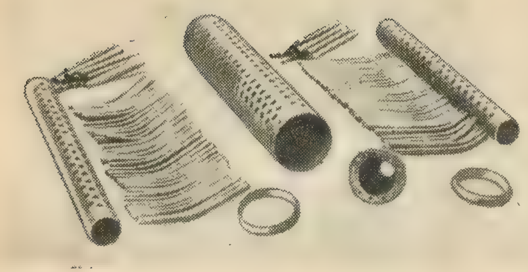
Eighteen years ago I built a 1:24 model of a typical warm-blast charcoal furnace plant, which some of my friends have dubbed "Etna Junior."

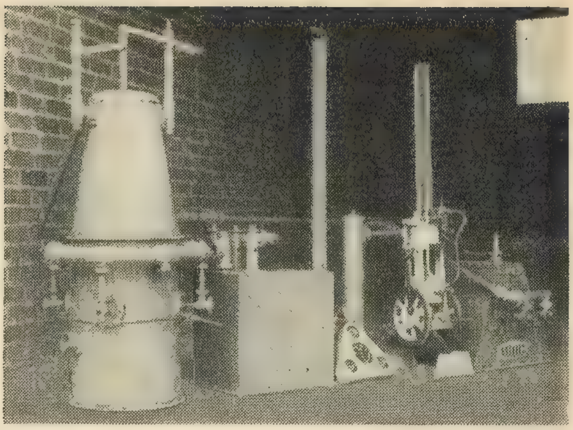
The stack is 36 in. high, lined to 9 in. bosh and 5 in. hearth, which has four $\frac{5}{16}$ in. dia. water-cooled copper tuyeres. The adjacent rectangular box houses the multi-pipe warm-blast store for preheating the blast, and between it and the engine is a cold-blast receiver.

Right: The boiler-tube assembly after brazing
Below: V-pipe and bed casting assemblies for the warm blast store









Above: The boiler components before brazing

Right: General view of the plant

The long-crosshead vertical blowing engine has 2 in. steam and 4 in. air tubes with a $2\frac{1}{2}$ in. stroke. Separate piston valves handle the steam and exhaust, and the steam chest pressure is 100 p.s.i.—cut-off about 28 per cent stroke. The boiler feed pump is via eccentric on the crankshaft.

The multi-tubular boiler, to the right side, was partly fired by gas and partly by charcoal. When installed the baffles separated the banks of U-tubes within the store housing.

The model has now been dismantled—a move to smaller quarters compelled its disposal, and I have retained only the engine. ■

Largest artificial lake

ALTHOUGH not strictly within the sale of model engineering, the Kariba Dam, now being built on the River Zambesi in Rhodesia, is probably of interest to most readers, if only on account of the vastness of the project.

The aim of the scheme is to provide cheap electricity for most of the Federation of Rhodesia and Nyasaland. Current in the Federation now costing 0.72d. per unit will cost eventually only 0.28d. per unit.

Work on the dam and associated projects was started in 1954, and it is hoped that the scheme will be in operation by 1962, when a lake will be created 175 miles long × 40 miles wide with a depth between 100 and 400 ft., easily the largest artificial lake in the world. Power output from its enormous potential is likely to reach 1,300 million watts.

Although the main civil engineering contract, worth over £25 million, has been awarded to an Italian company, Impresit (Kariba) Pty. Ltd, British firms are concerned in quite a big way. For instance, the preliminary work, worth £$1\frac{1}{2}$ million, was carried out by Cementation-Laing; the 140,000 b.h.p. water turbines are being supplied by Boving and Co., of London; generators by Metropolitan-Vickers; transformers by English Electric and Ferranti; railway sidings by John Laing and Son; and the electric travelling cranes by Babcock and Wilcox. ■

GAMAGES BELT SANDING MACHINE

We regret an error which occurred in Gamages' advertisement in the issue of October 10. The carriage and package for a belt sanding machine should have been 7s., outside the extensive van delivery area.

ENGRAVING BY SOUND

THE Mullard ultrasonic engraving tool L.274, development models of which were shown at the recent Instruments, Electronics and Automation Exhibition, has now been put into full production.

The L.274 is suitable for engraving surfaces or for drilling small holes of any shape in hard and brittle materials like glass, ceramics, tungsten carbide, and precious, semi-precious and synthetic stones and so on.

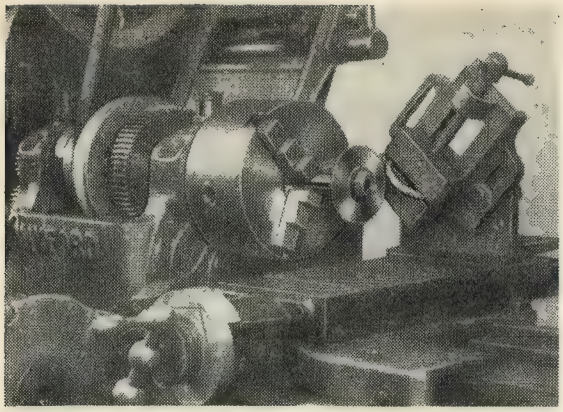
The L.274 incorporates a water-cooled magnetostriction transducer operating at a frequency of approximately 27 kc/s. Transducer vibration is transmitted to the cutting tool by means of resonant step-up velocity transformer.

For the majority of operations the cutting tool is a soft steel tip, identical in shape and size with the hole or pattern it is required to make. A diamond-tipped or diamond-loaded tool is used for fine engraving. The cutting tool screws into the end of the velocity transformer, and can be changed readily.

The size of the cut is variable between 0.005 in. and 0.25 in. (maximum lateral dimension) and the depth of cut is limited to 0.375 in. Silicon carbide, boron carbide or diamond, according to application, are suitable abrasives. Diameter of the tool is 0.72 in; length is 8 in., approximately, and it weighs 0.5 lb.

One litre of water a minute, at normal tap pressure, will keep the drill cool. A precision mounting shank (diameter 0.75 in., length 1.0 in.) is provided for attaching the tool to a drill stand or pantograph head.

The ultrasonic generator has an ultrasonic frequency of 27 kc/s at approximately 30 watts. Mains supply can be 110-150 v., 200-250 v., at 45-60 c/s. Consumption is approximately 300 watts, and the overall dimensions of the machine are 11 in. high × 12 in. wide × 10.25 in. deep. ■



The lathe set-up for slitting the ring blanks

BRONZE PISTON RINGS

By H. E. White

*Author of Maintenance and Management of Small Locomotives**

PRECISION finished, hammered and ground cast-iron piston rings can be purchased quite cheaply, made to standard sizes down to less than one inch, and for this reason alone many builders of small locomotives have decided to use cast-iron or built-up steel cylinders, pistons, valves and valve chests for locomotives of 1 in. scale or less. Experience has taught me to agree with our old friend LBSC that these items are much better made from gunmetal or bronze castings.

The use of non-ferrous alloys for making piston rings is by no means new, although it is still somewhat unusual. It is easily possible to make pistons and piston-valve bobbins which are a sufficiently close fit in small bores to be steam-tight without piston rings, the provision of slots to hold soft packing being a device which is more useful in assisting lubrication than in preventing the leakage of steam.

A year or two ago my friend J. E. R. Wuidart, the chairman of the North London SME, showed me a beautifully made set of 1¾ in. dia. bronze piston rings which he was fitting to his 5 in. gauge Atlantic engine, and I decided to make some experiments on my own account with a view to rings to the three 1¼ in. dia. pistons of an engine I am constructing.

I was worried about the possibility of distortion caused by springing open the rings in order to pass them over the piston flanges, and I made up a set of two-piece pistons, as shown diagrammatically in Fig. 2. I found, however, that by making the rings in eccentric form and using a suitable thickness, it was easily possible to fit them to one-piece pistons without appreciably deforming the rings.

The shape and dimensions of the rings are shown in Fig. 1. The material used was a scrap piece of 1½ in. dia. bronze marine propeller shaft, but cast phosphor-bronze stick, with a cored hole, such as is supplied by metal merchants and engineers' stores for making bearing bushes, can be used with equal success.

The first job, after deciding on the dimensions of the rings, is to make up the fixture used for finish-turning them. This is shown in Fig. 3.

A piece of 1½ in. round b.m.s. is shouldered down to 1¼ in. dia. for a length of 1¾ in., and then further shouldered down to ⅜ in. dia. for a length of 1¼ in. Next, a register ⅛ in. long is turned to a depth of 0.050 in. (1.150 in. dia.), or, if you are not working with a micrometer, a depth of slightly less than $\frac{1}{16}$ in.

Mark the position on the workpiece of No 1 jaw of the self-centring chuck, remove and rechuck it in a four-jaw chuck, setting it to run 20 thou " out " using an indicator. Now re-turn the register to a diameter of 1.128 in., which will allow a two thou clearance for the piston ring.

Make a punch mark on the face of the register to indicate the point where its circumference is nearest to the 1¼ in. dia. shoulder (i.e. where the narrowest part of the ring will be). Replace the fixture correctly in the s.c. chuck and screw the projecting ⅜ in. dia. pin with a BSF thread for ⅜ in.

Before removing the fixture from the chuck, take a skim off the face of the register so that it projects slightly less than ⅛ in., to ensure that a ⅛ in. wide ring-blank will be gripped firmly by the clamping piece: make sure you do not efface the punch dot. Finally, make up the clamping piece, which is a simple turning and drilling job.

If you are not working with a " mike " the job may be carried out satisfactorily as follows.

After you have turned the register to a diameter of a little over 1⅛ in. loosen the s.c. chuck jaws and insert under one of them a piece of stiff paper, folded to give a suitable thickness. If drawing paper (usually about 0.004 in. thick) is used and if it is folded in four it will give a thickness of 16 to 18 thou, which will provide the desired eccentricity.

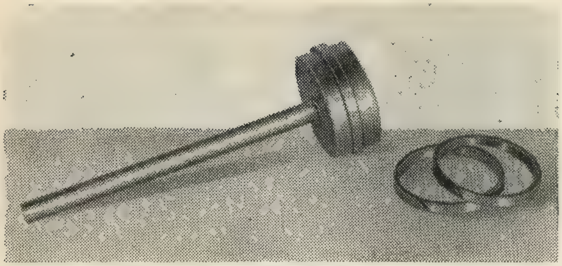
Coat the register all round with mechanic's blue, and turn the circumference until all the blue is just cleaned off. Remove the paper packing from the chuck jaw and complete the rest of the job as described.

It will be noted that I have designed this fixture to turn the rings one at a time, so that they may be fitted individually, each one to its own cylinder. If you wish, the fixture may be made with the register long enough to accommodate any number of rings so that they may all be turned at one setting.

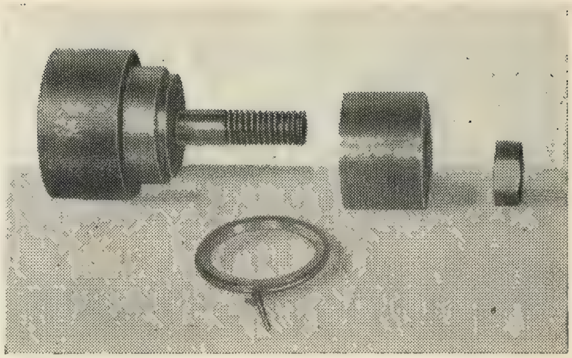
Now for the rings. First bore out the piece of bronze in the s.c. chuck to a diameter which is 0.020 in. larger than the desired inside diameter of the finished rings (Fig. 4). In my case, this was 1.130 in. + 0.020 in., i.e. 1.150 in. The non-mike man will have to caliper the register, and increase the diameter by 20 or perhaps 25 thou by the intelligent use of a feeler gauge.

Turn down the outside diameter to 1 9/32 in. for a suitable length, and carefully part off as many rings, ⅛ in.

* *Obtainable from Percival Marshall Ltd, 19-20 Noel Street, London, W1, price 12s. 6d., or 13s. 6d. post paid.*



Above: A set of finished rings, one of them fitted to a piston



Right: Fixture for turning rings, showing holder, clamping piece and nut, and a ring blank with the slot closed by a wire ring

wide, as you will need, plus one or two extras, just in case you make a mistake later on. This parting off must be done precisely, as the width of the ring is an important dimension. I clamped the saddle tightly, and with a freshly-ground $\frac{1}{16}$ in. parting tool, I was able to part off $\frac{1}{8}$ in. wide rings to quite close limits by using the top-slide index. A few experimental cuts on a stub of scrap bronze may be necessary if you are not quite sure of this job.

Each ring must now be slit with a $\frac{1}{16}$ in. slitting saw, at an angle of 45 deg. This may be done by hand, of course, but it is much better to use machining methods, since the two edges of the slit are then bound to be straight and parallel: if they are not, a certain amount of steam leakage is inevitable.

Set up a small machine vice at 45 deg. on an angle-plate (I used a piece of 3 in. × $\frac{5}{16}$ in. angle from the scrapbox) so that the centre of the jaws is at lathe-centre height. Clamp this on the end of the cross slide and mount a $\frac{1}{16}$ in. slitting saw on an arbor in the s.c. chuck. It is now a simple matter to grip one of the ring blanks in the vice-jaws, move the saddle along the bed until the saw is opposite the highest point of the ring and carefully cut the slot; do the lot while you have the set-up in the lathe.

The final job is finish-turning, using the fixture which you have already made for holding the ring blanks. Close the slots by placing a ring of iron wire round one of the rings and tighten by twisting the ends together. You could, of course, make up a special circular clip for this, or even use a Jubilee hose clip, but it is very easy to close the gap with a piece of 20 s.w.g. galvanised iron wire.

The closed ring should now fit snugly over the register. Note (this is important) that the blank must be placed so that the slit is in line with the punch mark you have made to indicate the narrowest portion of the clamping face. Fit the clamping piece and nut, and tighten up. Carefully turn the ring, using a knife tool with the point stoned off; in effect a very fine round-nosed tool. I used the actual cylinder bore as a gauge, turning the ring down with very light cuts until it was a fairly close push fit in the bore.

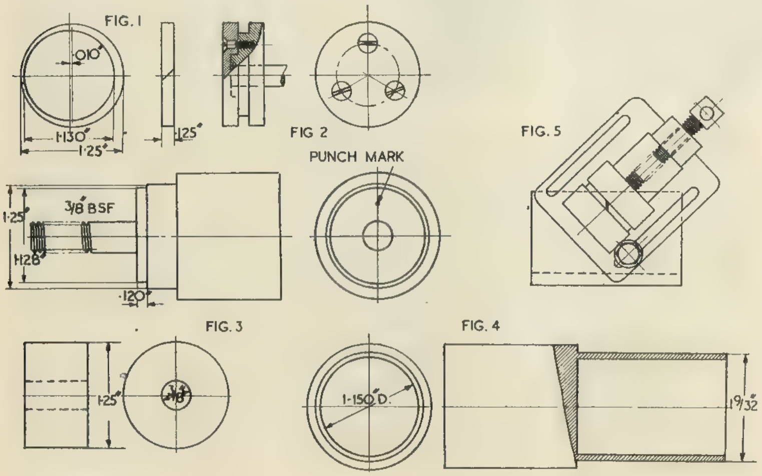
Lapping or any other method of improving the finish is not considered to be necessary; a good tool finish should soon wear itself in to give a frictionless and steam-tight fit so long as the ring is turned to a close or even tight fit in its own cylinder bore.

It is important that the rings should be a good fit in the piston slots. It would be better, of course, to leave the pistons "plain" until after the rings have been made; the slots could then be carefully opened out until the rings just slipped nicely inside without any side play. If the piston slots have already been turned, the rings should be fitted to the slots before any attempt is made to spring them over the piston flanges. Test by inserting them edgewise into their slots.

Nothing can be done if they fit too loosely—scrap them and start again. If they are—as mine were—a tight fit, they may be eased by very lightly rubbing the side faces on a piece of fine emery paper laid on a surface plate, or any flat surface, until they fit without shake at any part of their circumference. When you are quite sure that the width of the ring is right, and not until then, you are ready to spring the ring into its slot.

Do this with great care: if the ring is opened out unnecessarily it will bend and become distorted; remember also that although it is a comparatively easy matter to get the ring safely into its slot, it is a very different problem to remove it without causing distortion.

In my opinion it is not advisable to try to fit non-ferrous rings in this way to pistons of much smaller diameter than $1\frac{1}{4}$ in.: for pistons or piston valves of 1 in. dia. or less it would be much safer to use divided pistons or bobbins rather than to risk distorting the rings by opening them out beyond the elastic limit of the metal. ▣



M P B REGATTAS

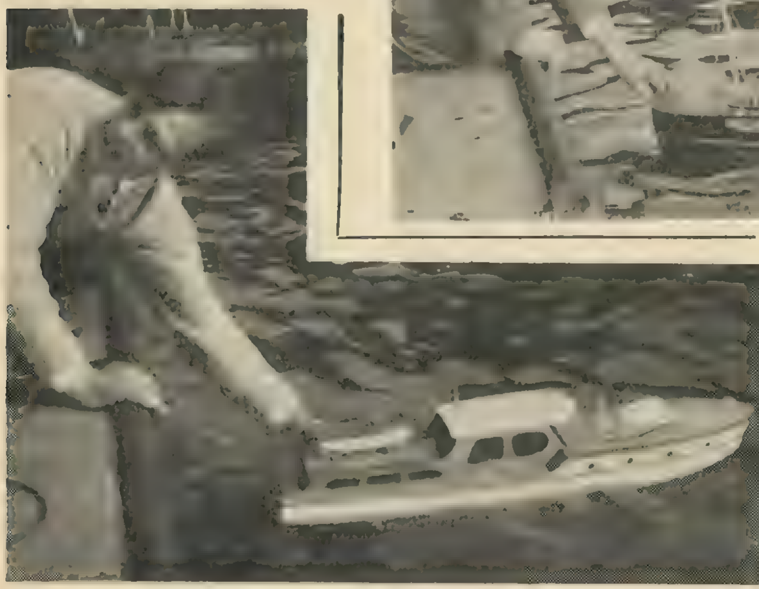
With reports this time from our correspondents in Sheffield, East London and Hull . . .

Sheffield

Reported by Northerner

ARTHUR WINTERBOTTOM, popular member of Sheffield Ship Model Society, had a field day at the club's recent regatta. His Broads cabin cruiser won him two first prizes and two seconds. It is based on the cruiser on which he spent his holidays last year.

The boat's first awards were gained under radio control, winning maximum points—36—in the Steering competition, and achieving five successes in three minutes in the Balloon-Bursting competition.



Above: Jack Lee, of Sheffield, with his well-detailed pilot boat, which is radio-controlled

Left: One of the Barnsley boats—it was built by Eric Jaques—being launched by Roy Sidebottom

Below: This damsel on water skis towed by Jack Swift's cabin cruiser was highly popular with the spectators!

In free-running events Arthur was runner-up to Alan Slack both times: in the Nomination event with 0.8 sec. error against none and in the Steering with two points against three.

The runner-up in radio-controlled steering was Jack Swift with 34 points, and in Balloon-Bursting Syd Davison with four.

Held in Millhouses Park, the regatta attracted many members of the public.

MPBA Grand Regatta

By Meridian

THE immense popularity of model power boats was again demonstrated at Victoria Park when the Model Power Boat Association held

Left: GWEN II, *Syd Davison's cabin cruiser, has a double diagonal-planked hull with cloth resin-bonded on*

Above: *Arthur Winterbottom launches his Broads cabin cruiser. It won the Balloon-Bursting competition*

its annual grand regatta.

"Grand" is certainly the operative word, for the list of straight runners alone this year reached a new high of 125 entries!

Among the early contestants were Messrs Wilk and Prichard of the Highgate club. Both made good clean runs, and the respective errors of 0.1 and 0.4 secs kept them in the

Above: *A few of the prototype boats lined up for the Steering event*

Left: *The steam launch* PYM *starting a run in the Steering competition*

lead throughout the event, even when calculated on percentage error. L. J. Crockett (Bromley) completed a good run with a result within 0.5 sec., while Ted Walker (Kingsmere) achieved an 0.7 sec. error with the evergreen *Coron*.

After the Nomination came the turn of the 10 c.c. hydroplanes but they fared very badly on the disturbed water—only three boats of those competing in the C and C Restricted races succeeded in completing the distance!

Main item on the programme—the

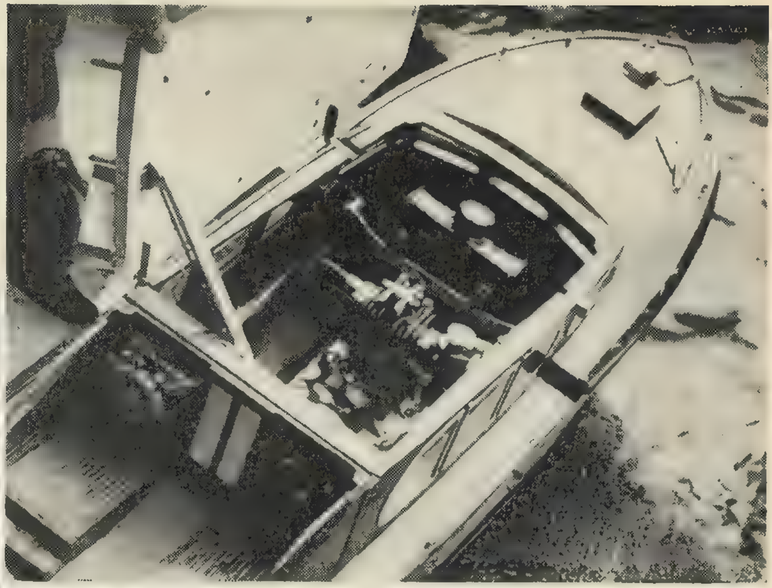
steering competition for the oldest MPBA trophy in existence—ran through in a remarkably facile manner considering the large entry.

More than three-quarters of the boats had completed three runs with no higher score than eight—made by several competitors, and it was left to A. Rayman (Blackheath) to make a score of nine with his well-known steamer *Yvette*. Bulls were scored on several occasions but no one could imitate the feat which would have ensured first place. The score of nine remained unbeaten at the finish, and three exponents with eight points apiece had to fight it out for the lower places in the prize list.

R. Godwin (Swindon) emerged the leader after three re-runs with A. Newcombe (Victoria).

Winner of the prototype competition was S. Stevens (Bromley) with his fine launch *Lillena*. It should be explained that a boat once having won this event is not eligible in subsequent years. This automatically eliminates many of the prototypes present at the regatta.

Highlight of the racing was a magnificent run made by *Nipper* 3, the Class B job built by M. de B. Daly (Blackheath). A speed of 65.99 m.p.h. was attained, which is less than one mile per hour short of the class record already held by this competitor. Unfortunately, one lap after the measured distance the sponsons were ripped off in a spectacular capsize, thus preventing another attempt.



Above: The Dolphin engine of S. Stevens' LILLENA *(Bromley), winner of the Prototype Cup*

Left: J. Hampton (Southampton) starting a new boat in the C Class event

Below: Bob Curwen (Bromley) with his Seal-engined cruiser VANESSA*—recently described in ME—in the Steering competition*

In Class A the Speed Championship Trophy went to S. H. Clifford (St Albans) with his new boat *Poly Ester*. This hydroplane is definitely one of the better-looking boats, being streamlined in a clean manner with excellent finish. Speed was 54.11 m.p.h.

The Crebbin Trophy for flash steamers came into circulation again as J. Bamford (Aldershot) managed this year to complete the distance with *Hero*. Speed was good over the first four laps, but a slow fifth dropped the average speed considerably.

Grand Regatta Results

80 yard nomination event

1 J. J. Wilk (Highgate), *HG* 30: 0.25 per cent error.
2 E. Prichard (Highgate), *HG* 22: 0.9 per cent error.
3 L. J. Crockett (Bromley), *BY* 14: 1.5 per cent error.
4 Mr Till (Portsmouth), *PM* 42: 1.9 per cent error.

500 yard race for Victory Cup, Class C

1 R. Phillips (St Albans), *Foz* 2: 54.26 m.p.h.
2 J. Jones (Altrincham), *Mambo*: 45.05 m.p.h.

500 yard race for ED Trophy, C Restricted

1 K. Hyder (St Albans), *Slipper* 5: 54.4 m.p.h.

Steering for the MPBA Steering Trophy

1 A. Rayman (Blackheath), *Yvette*: 9 pts.
2 R. Godwin (Swindon), *Truant*: 8 + 3 + 0 + 5 pts.
3 A. Newcombe (Victoria), *V48*: 8 + 3 + 0 + 3 pts.
4 R. Griffiths (Victoria), *V23*: 8 + 0 pts.

500 yard race for Mears Trophy, Class B

1 M. de B. Daly (Blackheath), *Nipper* 3: 65.99 m.p.h.
2 F. Jutton (Aldershot), *Nike*: 48.7 m.p.h.
3 J. Bamford (Aldershot), *Jab*: 45.45 m.p.h.

500 yard race for Speed Championship, Class A

1 S. H, Clifford (St Albans), *Poly Ester*: 54.11 m.p.h.
2 J. Benson (Blackheath), *Orthon* 2: 48.24 m.p.h.
3 J. Bamford (Aldershot), *Hero*: 34.6 m.p.h.

Crebbin Trophy

J. Bamford, *Hero*: 34.6 m.p.h.

Prototype Cup

S. Stevens (Bromley), *Lillena*.

Hull IRCMS

Reported and photographed by R. Beharrell

RAIN stopped just in time for Hull's meeting at East Park Model Boat Lake at which the group welcomed competitors from Manchester and Tyneside.

First phase of the steering contest was closed by Mr Marler (Manchester) with a Thornycroft range safety launch possessing six-reed proportional steering and speed control, followed by Mr Bailey (Tyneside). Despite the fact that a salvo of depth charges carried by Mr Bailey's craft appeared to go off prematurely, spectators were much impressed—as they were at the end of the course when the boat fired its "misguided" missile !

Mr Bailey won the contest, with Mr Dowsey, also of Tyneside, second.

In the Class C speed event, where boats were taken at speed round the outside markers of the steering course, a tie resulted between Mr Aldridge and Mr Dowsey. Honours were taken by Mr Dowsey in the deciding run.

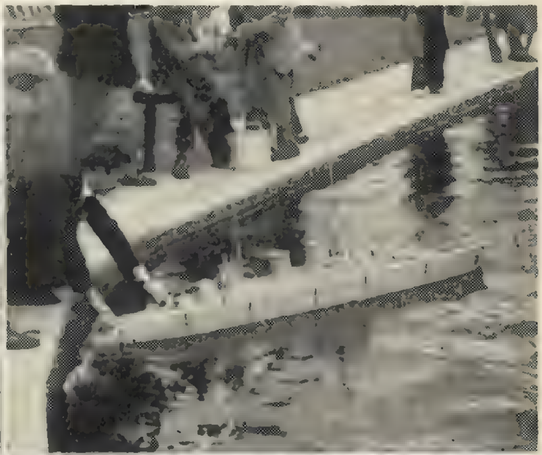
Mr C. Dews, chairman of the Hull Group, gave a good demonstration of speed and manoeuvrability with his extremely well-finished model of an RAF launch powered by a 2.46 diesel engine, while a 7 ft 9 in. cruiser—it was propelled by four electric motors driving four propellers—built by Mr Drury, of Hull, thrilled the crowd with its high-speed performance.

Below: The Thornycroft range safety launch

Bottom: General view of the boat enclosure

Below: The seven-footer about to be launched

Bottom: Fire tender built by chairman C. Dews



ROSE

LBSC now describes how to erect the boiler and connect up the pipes, with details of the spirit burner for firing it

Continued from 10 October 1957, pages 518 to 520

This simple boiler will be found easier to erect than the regular locomotive type as neither grate nor ashpan is needed, nor will expansion brackets be necessary. As both frames and boiler casing are made from the same kind of material they expand and contract together. I have found that direct attachment is quite satisfactory—and very easy !

The first job is to make up the steam pipe and blast pipe. No separate drawings of these will be required as they were shown in the illustration of the boiler erected on the frames. The steam pipe is a 1 in. length of 3/16 in. copper tube with 1/8 in. of 3/16 in. × 40 threads on one end, and a 1/4 in. × 40 union nipple on the other. This must have a hexagon base so that it can be held with a spanner while the union is tightened up otherwise the pipe will twist and probably break off.

Chuck a piece of 5/16 in. hexagon rod, face, centre deeply, turn 1/4 in. length to 1/4 in. dia. and screw 1/4 in. × 40. Drill No 40 to 1/2 in. depth, part off at 7/16 in. from the shoulder, reverse in the chuck and open out the hole to 1/8 in. depth with a No 14 drill. Fit the plain end of the steam pipe into the hole and silver solder it. After the boiler has been erected it is screwed into the tapped hole in the steam chest.

The blast pipe is a 1½ in. length of 1/4 in. copper tube. Both ends are screwed 1/4 in. × 40. Soften the pipe, screw it into the tapped hole in the cylinder and bend it approximately to the shape shown in the drawing. Final adjustment is made when the boiler is erected.

The nozzle is made from 5/16 in. hexagon rod in the same way as a union nut, the hole being drilled 3/32 in. or No 43. Bevel off the end to a short cone and fit after erecting the boiler.

Exactly under the chimney liner drill a 5/16 in. hole in the boiler shell for the blast pipe. At 3/8 in. ahead of this and 7/16 in. to your left when looking at the front end, drill a 1/4 in. hole for the steam pipe. (The position of this is shown in the drawing of the front end in a previous instalment.) The boiler can then be placed in position between the frames, with the blast pipe going through the hole in the casing at the front end, which automatically locates it.

The back edge of the smokebox wrapper should be approximately level with the step in the top of the frame above the cylinder, but a sixteenth of an inch either way doesn't matter; it will affect neither the working nor appearance of the engine.

The correct height of the boiler bottom above the top of the frames should be 1/8 in., but a fraction more or less will be of no consequence. The bottom of the firebox should be 1/2 in. below the top of the frame, and the bottom of the smokebox wrapper 3/16 in. below.

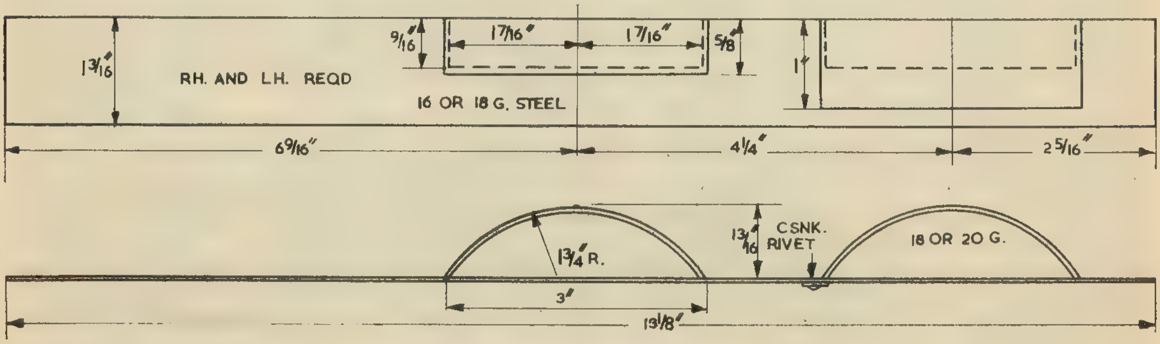
To secure the boiler in position, just drill two No 41 holes through the bottom of the smokebox wrapper and frame as shown in the drawing of the boiler erected, and two more through the side of the firebox and frame—on each side of the engine.

Countersink the holes on the outside of the frame, put 3/32 in. or 7 BA countersunk-head screws through, use ordinary nuts at the smokebox end, and pieces of 3/32 in. brass, about 1/4 in. square, drilled and tapped like ordinary nuts, at the firebox end. These won't crush into the asbestos lining as ordinary little nuts would do.

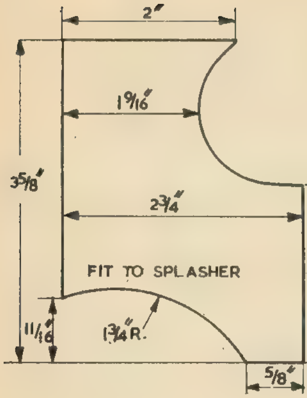
PIPE CONNECTIONS

Smear the thread on the steam pipe with plumber's jointing and screw it through the hole in the barrel into the tapped hole in the steam chest, keeping it at right angles to the cylinder. Then screw the union nut on the superheater loop on to the nipple, holding the hexagon part of the nipple with a spanner while the nut is being tightened. Screw on the blast nozzle and put a piece of 3/32 in. silver steel—this should be straight enough for the job—down the hole in the nozzle. It should stand up exactly in the middle of the chimney liner; if it doesn't carefully bend the blast pipe until it does.

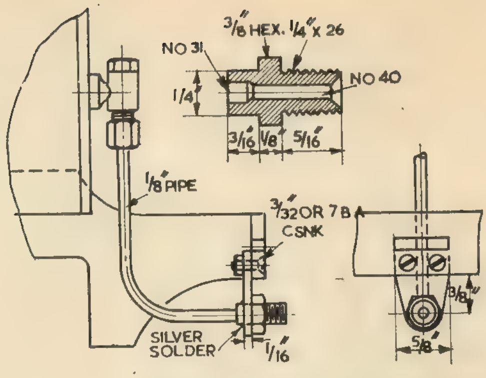
Bend the blower pipe until the little nozzle on the end lies snugly alongside the blast nozzle so that the jet steam from it will go up the liner. It should require no further fixing, the pipe being stout enough to sustain it.



The running boards and splashers



Left: Side of the cab



Above: The boiler feed connections

The interstices around the steam and blast pipes where they pass through the shell, can be sealed by wetting a few scraps of asbestos millboard, kneading them up into a kind of putty and pressing some into the cracks, leaving a little fillet around each pipe.

To feed the boiler when under steam a ¼ in. × 26 union is fitted in a bracket under the drag beam and connected by a ⅛ in. pipe and union to the clackbox on the backhead. This is located in the middle of the beam, under the drawbar slot, so that the movement of the tender pipe will be the minimum possible on curves.

To make the union chuck a piece of ⅜ in. hexagon rod, face the end and turn 3/16 in. length to ¼ in. dia. Part off at ⅝ in. from the end, reverse in the chuck, turn 3/16 in. length to ¼ in. dia. and screw ¼ in. × 26. The coarser thread is easier and quicker to couple up than ¼ in. × 40 and lasts longer as the union has to be coupled up every time the engine is put in steam.

The finer thread is better for fittings which are "static." Centre the end deeply with a size E centre drill and put a No 40 drill right through. Reverse again, and open out the hole to ⅛ in. depth with a No 31 drill.

A tip to beginners: don't drill through and open out at the first turning operation to save the second reverse as the centre drill will chatter when you try to form the countersink with it, and the union won't screw up watertight.

The bracket is cut from 16-gauge steel to the dimensions shown, and a ¼ in. hole drilled in the taper part. Fit the plain end of the union into this, then put a 3¼ in. length of ⅛ in. copper tube in it, and a union nut and cone on the other end for connection to the boiler clack.

Silver solder the union into the bracket, the pipe into the union and the cone on the other end, at one heating, softening the pipe at the same time. Pickle, wash off, clean up, bend the pipe to shape and attach the bracket to the inner side of the drag beam by two 3/32 in. or 7 BA countersunk screws nutted as shown.

With this "one-piece" construction there is no risk of the union shifting in the bracket when coupling or uncoupling.

FIRING ARRANGEMENTS

The boiler is fired by a six-wick spirit lamp fed from a tank in the tender via a sump in which a constant level of spirit is automatically maintained; this prevents the burners flooding. The construction of the lamp should be as light as possible.

For beginners' enlightenment, if the lamp is made from heavy tubing, it overheats, the spirit boils and is blown out of the feed tubes. The flames die down and the engine loses steam until the feed tubes cool sufficiently to allow the spirit to return to the burner tubes.

The complete outfit was shown in place under the boiler in an illustration, recently published, when all dimensions were given. The wick tubes are made from the thinnest available brass tube of ⅜ in. dia., six pieces being required.

Face both ends in the chuck to 1½ in. length and turn a piece of brass rod to fit very tightly in the tubes, then part off six 1/16 in. slices and press each into one end of each tube. At ¼ in. from the plugged end of four of the tubes drill a No 30 pilot hole clean through, open out with 15/64 in. drill and ream ¼ in.

That is the only way to get clean holes in the thin tubes; if you drill direct they will be polysided. The other two have a similar hole in one side only.

The feed tubes are two pieces of thin ¼ in. brass tube 3⅞ in. long. At a full 1 in. from one end file a nick about 1/16 in. deep with a ¼ in. round file on the opposite sides of the pipe. Repeat the process at 1 1/16 in. farther along and remove any burring so that the holes are left perfectly clean.

Push two of the wick tubes with the thoroughfare holes on to each feed tube, and the remaining tubes with the single holes on to the ends. Set the wick tubes at 1 1/16 in. centres, and see that the holes in the feed tubes are at top and bottom, as shown in the drawing previously referred to.

TUBES AND SUMP

The feed pipes are connected at the back end by a small auxiliary sump made from a piece of thin brass tube ½ in. dia. and faced off at each end in the lathe to 1¼ in. length. Plug each end of this with a disc of 1/32 in. brass, or a thin slice parted off a piece of rod turned to fit.

Drill and ream two ¼ in. holes at ⅝ in. centres in one side, and diametrically opposite—in the middle—drill another. Fit the ends of the feed tubes into the two adjacent holes, and in the odd one opposite fit a ½ in. length of the same kind of ¼ in. tube.

See that the spacing of the wick tubes and sump are as shown in the drawing and the feed tubes parallel, with the sump at right angles to them. Then carefully silver solder all the joints, using best-grade silver solder and jeweller's borax—or Easyflo and the special flux sold for use with it. After pickling, wash thoroughly, letting the water run through the tubes and sump, then dry thoroughly by warming it.

The complete bag of tricks is supported by a bracket bent up from a strip of ⅜ in. × 3/32 in. steel to fit between the frames, same as the motion bracket.

Set it right up as close to the trailing

ROSE . . .

continued

hornblocks as possible, the underside being 3/32 in. below the level of the bottom of the frames, and secure it in position by two 3/32 in. or 7 BA countersunk screws at each side, running through No 41 countersunk holes in the frames into tapped holes in the sides of the bracket.

In the middle of the bracket drill a No 40 hole and tap it ⅛ in. or 5 BA. Cut a piece of ⅛ in. × ⅜ in. steel to 1¼ in. length and drill a No 30 hole in the middle. This forms a cleat which clips the feed tubes to the underside of the bracket as shown in the drawing, a ⅛ in. or 5 BA cheese-head screw being put through the hole in the cleat (between the feed tubes) into the tapped hole in the bracket, rendering the complete lamp instantly detachable.

The wicks, which should be loose, are strands of asbestos string. The sump is kept supplied with spirit when the engine is working by a rubber tube attached to the short pipe at the back, running to a similar piece of pipe attached to the automatically-fed sump which will be fitted under the tender.

BOILER MOUNTINGS

The chimney can be turned from a casting or from a piece of 1⅛ in. round rod. The casting should be chucked in the three-jaw and bored out—like boring a cylinder—to a push fit on the liner. It can then be mounted on a mandrel between centres and the outline turned either to the shape shown or any other that the builder might fancy.

Personally, I like the stovepipe chimney. I have a 2½ in. gauge LNWR 4-4-0 of the Precursor type, and as the typical LNWR smokebox and chimney always seemed to look rather clumsy, to my way of thinking, I fitted her up with a circular smokebox on a saddle and perched a raky little stovepipe chimney on top of it. The result was startling! The "heavy" appearance of the front end disappeared entirely, and the little engine took on quite a racy look.

She *is* a racer, too. She can dash around my line at a speed which makes me wonder how she keeps on the rails, and despite the fact that the grate is less than 1 in. wide and only 2¾ in. long, the boiler steams like a witch when properly fired. Curiously enough, old LSWR and GER drivers whom I knew in days now long past always emphatically insisted that the engines with the stovepipe chimneys steamed better than those with ordinary bell tops.

Quite recently a Maunsell Q class 0-6-0 has been running with a stovepipe chimney, and every time she has passed the back of my hacienda she has been blowing off. I notice that a similar chimney has also been fitted experimentally to one of the LMS 4-6-0s, so the old drivers may have been correct !

The base of *Rose's* chimney cannot be turned. This being the case it must be carefully filed (this can be done while it is on the mandrel) and finished with emerycloth while revolving. The casting will be curved to fit the boiler, and can be bedded down by merely putting a piece of emerycloth over the boiler barrel and rubbing the chimney on it. This also applies to the dome casting.

THE DOME

To turn the sides and top of the dome chuck a piece of hard wood and rough-turn it to the size and shape of the inside of the casting. Press the dome on this without removing the wood from the chuck, then centre it with a small centre drill in the tailstock chuck. Put the back centre point in the tailstock barrel and bring it up to support the casting while you do the necessary with the turning tool, and finish with emerycloth.

The dome is held in position by a long screw with a countersunk head, running through the hole in the top of the dome into a tapped hole in the dome plug. The screw is easily made by silver soldering a little boss on the end of a 1⅝ in. length of 3/32 in. rod, turning the boss to the shape of the screwhead and cutting a slot across it with a fine-tooth hacksaw.

This is quicker than turning the whole screw from a piece of ¼ in. rod, especially as you have to be careful owing to the slenderness compared with the length, but unless supported by a steady it is quite possible that the screw will break off on the last cut—though it isn't worth while rigging up the steady for a single screw.

The GER-type casing which was shown over the safety valve in the general arrangement drawing is a casting which only needs cleaning up with a file and drilling to fit over the safety-valve column. It may be dispensed with altogether if the top of the column is turned to the shape specified for *Zoe*.

It will, however, look rather lonesome as this type of safety valve invariably appears as twins, but a dummy column could easily be turned up and mounted on the boiler casing ahead of it to keep it company and preserve the correct appearance.

RUNNING BOARDS AND SPLASHERS

The running boards are cut from 16-gauge or 18-gauge mild steel to the dimensions shown. Clamp the two plates together to cut out the clearances for the coupled wheels, in the same way as the frames are cut.

The way I do it is to clamp the plates in the bench vice with the horizontal marked line just showing at the jaws, saw down each vertical line, then make another saw-cut at one end about ½ in. inside the vertical line. The piece is then broken out with pliers, leaving a gap in which the hacksaw blade can be put on its side, and the horizontal line sawn along (the vice jaws guiding the blade) until the other vertical cut is reached, when the piece falls out. A file smooths off the saw marks in a minute or so.

The sides of the splashers can be cut from thinner steel to the size illustrated. The GER engines had polished brass edges to the splashers, and if you want yours to follow suit make the tops of the splashers from 16-gauge sheet brass and just solder them to the sides, then polish up the edges. Otherwise steel strip can be used for the splasher tops. Mild steel will take solder quite well if the surfaces to be joined are filed bright.

The splashers can be soldered to the running boards or they can be attached by little bits of strip steel bent to the shape shown and riveted to the inside of the splashers and the underside of the running board by 1/16 in. rivets.

My own pet method is to build up the lot into a single unit with my oxy-acetylene blowpipe and Sifbronze, including the side of the cab and half the front, the whole assembly being attached to the tops of the buffer and drag beams by a couple of screws at each end so that it is easily removable.

The sides of the cab can be cut from 18-gauge or 20-gauge steel to the size indicated. Take care to make the radius fit exactly the top of the trailing splasher, which is wider than the driving one.

● *To be continued*

In the pits . . .

That model rail car track. Thrilling, wasn't it? But, as T. W. Pinnock lightheartedly points out, the lads behind the scenes didn't have such a dull time either

Most people who visited this year's Model Engineer Exhibition saw the model rail car track in operation. It seems to have attracted a good deal of interest—even from the steam fans!—but the spectators did not see everything that went on, and some readers may care to know a little of how it seemed to the mechanics in the pits.

The preparation

The story really starts some time before the Exhibition with the model car section of the North London Club heavily engaged in getting ready the track. This involved not only preparing the substructure, but in checking and cross checking the bracing, junctions and fish-plates, and tightening and locking all nuts so that the track would stand a fortnight's running without loss of rigidity.

Moreover, an electric lap counter—then in its early mock-up stage—had to be pressed forward to completion. The result of this work was that as far as a number of members were concerned their individual preparations went by the board and, in consequence, several promising cars failed to "last the pace" on the track.

On the Saturday before the Exhibition opened a fantastic collection of pieces of track, angle iron, starting meters, nuts, bolts and impedimenta arrived at the New Horticultural Hall. The track was laid out. The substructure was attached, condemned as unsuitable, detached, re-attached, strutted and finally approved.

The track stood complete and rigid. But there was a half-inch *gap* in the rail at one point! Twelve strong men lifted the track, pushed it, pulled it, wriggled it and closed that gap—only to find a smaller one elsewhere. So the process was repeated again and again until finally the joints all met. Then every nut was checked and tightened.

Sunday and Monday saw the fitting of the accessories, wiring of starters, the installation of the lap counter, the laying of the "grass" area and the setting out of such aids to realism as the Dunlop Bridge, the direction signs and the miniature advertisements. By Tuesday all was ready for the Press inspection.

Thereafter, the emphasis shifted remarkably. Until then all thoughts had been on the track. Would it fit in, was it rigid enough, would it last out? Afterwards the track itself concerned us very little—a daily check showed all was well. Now it was the cars that concerned us, the question of maintaining a regular service.

In action

This proved more complicated than we could foresee. We were putting on a quarter of an hour's running every hour of every day. After the running—which usually stretched to twenty minutes—we had ten minutes or so of answering questions.

So, if anything went wrong with a car there was half an hour to find the trouble and to put it right. And we could not test a car outside our running times, for the noise of an engine at once attracted spectators—and understandable complaints from other demonstrators.

Of course, as far as possible we tried to have sufficient reserves to allow for casualties. Nevertheless with the North London Society covering six of the Exhibition's ten days' duration this became progressively difficult.

The worst period, as far as we were concerned, came on the second Wednesday. But a policy of cannibalism and quick repairs (thanks to the Enfield Technical College) did enable us to put on something of a show.

Later the situation improved. For one thing Stan and Gordon had during the first part of the Exhibition built four cars, and that helped a lot. Again we had by that time found out what could be done on the spot—and what couldn't. Thus we seemed to have more time—more time to run the cars, more time to look around and more time to talk to interested spectators. And they *were* interested: they broke the barrier three times!

The last run on the last day was a festive affair. Cars were queuing up to get on the track. Arthur's Sunbeam (minus bonnet) was going very fast for short bursts, Bert's yellow peril was going sedately for hundreds of laps, Gordon's TR2 went round surprisingly fast, and the Cooper Climax went the right way! Then all was over.

And now next year

However, many things will stick in my memory. Gordon's overnight rebuild of his Lotus after a splintering collision with a dead car—the efforts of some hero to change the cards on the Dunlop scoring board at a rate of 20 a minute—the speed, and the scream, of the half c.c. cars.

It is a good game, and I think a lot of those who saw it would like to take a hand. You need a track and somewhere to put it and, unluckily at the moment, the North London track is the only one in London. But the track is not hard to make and can be packed away easily.

Full information on the sport is available and the cars themselves are easy to make and run. I hope that by the next Exhibition there will be more tracks, more cars, and even more sport. ▣

A TROLLEY
for the motor generator

DUPLEX concludes his two-part article with details of the steering assembly, pressure plate and axles

THE general arrangement of the steering assembly was illustrated last week in Fig. 4, but to make matters clearer my pictures (Figs 6, 7 and 8) show two views of the assembly dismantled with an illustration of the mounting plate fixed to the underside of the trolley platform.

The mounting plate *F* illustrated in detail in Fig. 9 is attached to the wooden platform by three $\frac{1}{4}$ in. BSF countersunk bolts depicted in Fig. 10. If thought advisable the heads of these bolts can be provided with a screwdriver slot; in practice this has not been found necessary because the shanks of the bolts themselves were made a firm fit in the plate.

The bush for the steering assembly spindle *E* already described is made a press fit in the plate which is counterbored to receive the head of the bush. If the press fit is firm there need be no fear that the bush will move in service. However, should there be any doubt on this point it is best to secure the bush by means of a grubscrew set axially half in the bush and

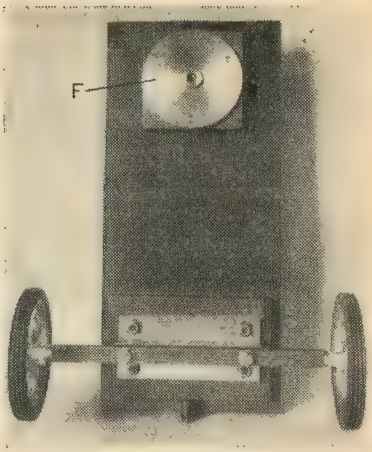


Fig. 8 : *Steering assembly dismantled*

half in the plate (Fig. 11). In this way the bush will be secured both against rotation as well as against movement endwise.

The pressure plate, made from mild

Fig. 9: *The mounting plate*

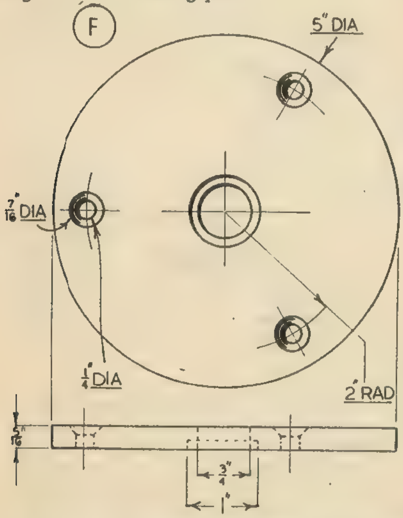
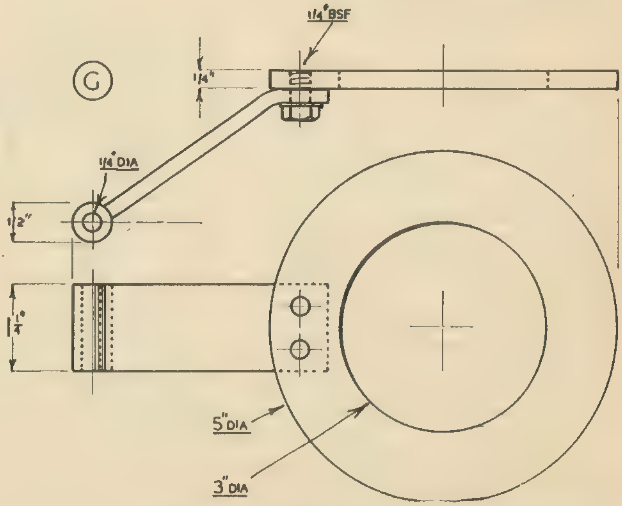
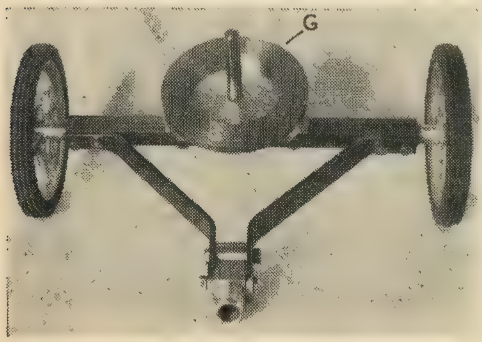
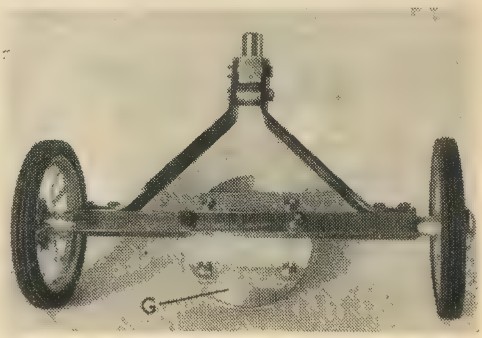


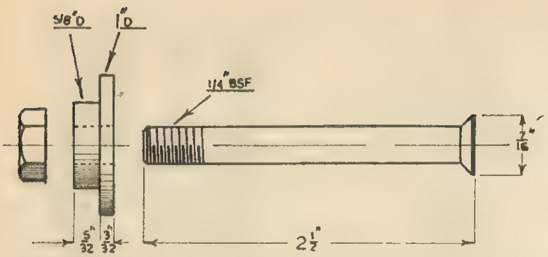
Fig. 12: *The pressure plate* G



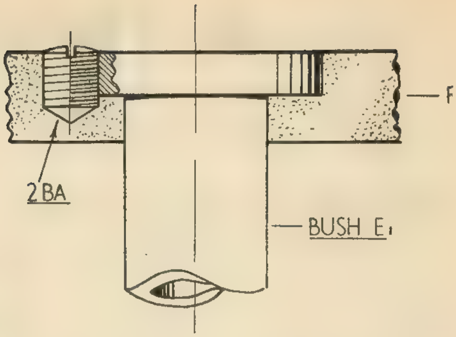


Left and right, Figs 6 *and* 7: *Two more views of the dismantled steering assembly*





Above, Fig. 10: *Bolts for the mounting plate attachment*



Right, Fig. 11: *Securing the steering-pin bush*

steel, is illustrated dimensionally in Fig. 12. A stay will be seen attached to the plate, its purpose being to steady the steering wishbone.

The plate is cut from mild steel plate by the well-known process of drilling round a previously marked out circle and then filing up the work so that it can be mounted in the chuck to enable the 3 in. dia. bore to be machined. To save both time and materials it is best to trepan out the core piece as this leaves a useful piece of flat material that may be used on another occasion.

To do this, a parting tool with considerable side clearance is mounted in the toolpost and fed into the work and, as will be seen from Fig. 13, the increased side clearance is needed to enable the tool to clear the work during the trepanning process.

Both front and rear axles are made from $\frac{3}{4}$ in. square mild steel. The dimensions are identical, with the exception of the two holes to take the $\frac{5}{16}$ in. dia. screws used to attach the axles to the two aluminium castings *C* and *D*.

The axles are turned between centres in order to produce the two $\frac{7}{16}$ in. dia. spigots for the road wheels. The keep rings for the wheels are also simply made from mild steel bar and are held in place by 2 BA Allen screws. The axles and the keep rings are illustrated in Fig. 14.

The wishbone consists of two pieces of 1 in. × $\frac{3}{16}$ in. mild steel bent to shape when hot in order to accommodate the distance piece and socket for the handle. ■

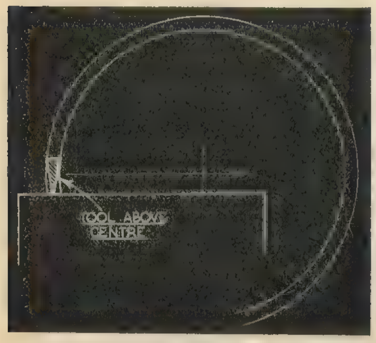


Fig. 13: *Setting the parting tool for the trepanning operation*

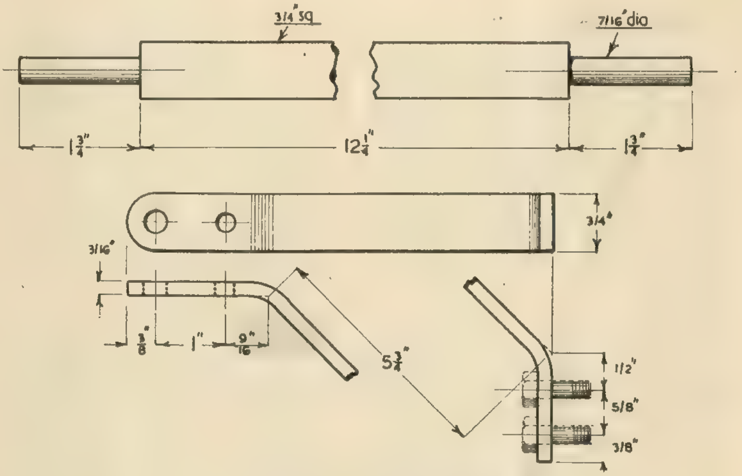


Fig. 14: *The axles and the wishbone*

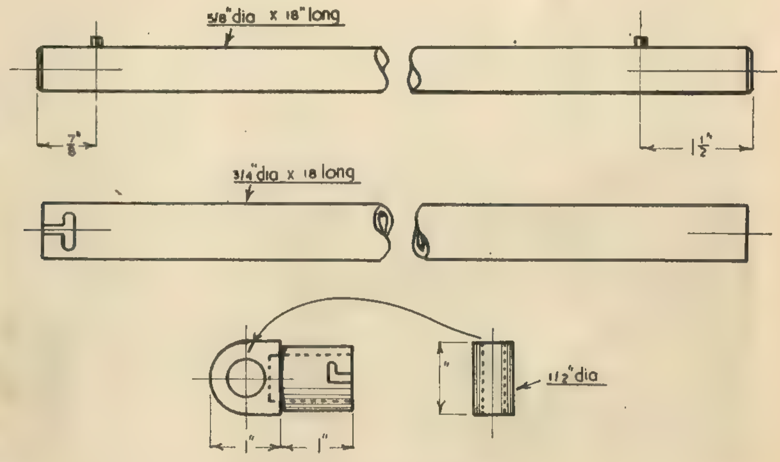


Fig. 15: *The towing handle*

READERS' QUERIES

Do not forget the query coupon on the last page of this issue

This free advice service is open to all readers. Queries must be on subjects within the scope of this journal. The replies published are extracts from fuller replies sent through the post: queries must not be sent with any other communications: valuations of models, or advice on selling, cannot be given: stamped addressed envelope and query coupon with each query. Mark envelope "Query," Model Engineer, 19-20 Noel Street, London, W1.

'At the ME Stand'

Our staff had ten busy days endeavouring to answer your questions. R. M. EVANS recalls some typical posers, which, he feels, may be of general interest to readers

UNDOUBTEDLY readers may have wondered what sort of technical queries the ME staff were called upon to answer at this year's Model Engineer Exhibition, and how their knowledge and/or experience stood up to the test!

I am speaking now as one connected mainly with the live-steam side of model engineering, but a good many technical queries were received during the course of the Exhibition, some of which may well be of interest to readers.

Live steam ? Bah !

Incidentally, many amusing questions were received from non-technical visitors, such as that from the elderly gentleman from the West Country who, having spotted the "smallest live-steam locomotive in the world" on the stand, wanted to know whether water was put in the boiler and how it was heated, etc., but despite a quarter-of-an-hour's explanation, he went away with the firm conviction that the model was driven by electricity!

Harking back to the technical, we of the ME staff naturally do not know the answers to everything; to be an expert on *every* branch of model engineering, one would have to be a super-man, indeed, but we like to think that we were of some assistance to model engineers, running up mainly against problems we ourselves have encountered in the course of our own work.

Several locomotive enthusiasts seem to have had difficulty with the position of holes in the main frames of the 3½ in. gauge locomotive *Britannia* and also with the amount of cutaway on the top of the frames just astern of the cylinders. Where holes are found to be in the wrong position it is not difficult to turn up short lengths of round mild steel of suitable diameter, force these in, and file off flush. Where additional material has to be added to frames, however, the operation is not quite so easy.

I had this problem some years ago in making frames for a 3½ in. gauge *Green Arrow*. I had foolishly cut the frames out to the line of the footplate edging, thus getting a concave front edge immediately next to the buffer beam and ahead of the cylinders, instead of the correct convex shape, with the frame lifting holes.

I got over this by cutting out a piece of mild steel of the same thickness as the main frames, butting this against the offending position on the frames and holding it there with the help of a home-made clamp (consisting of a few pieces of b.m.s. strip and suitable screws). I then laid each frame in turn across the domestic gas ring, turned my—one-pint—blowlamp on to it and brazed it in position.

While on the subject of *Britannia*, I recall one visitor who was having trouble in bending up and fixing the main horns to the frames. It will be remembered that in this design, the usual cast hornblocks are dispensed with and ⅜ in. × 3/32 in. flat b.m.s. strip is used, bent all around the three sides of the axlebox slot, with an equal amount protruding on each side of the main frame.

One way out of this difficulty would be to use b.m.s. angle ⅛ in. thick, put on the outside of the frames and riveted to them. Two pieces would be needed, ⅜ in. wide × ⅜ in. but, of course, a further 1/32 in. would have to be filed off each side of the opening to bring the angles to the right size for the axleboxes.

An enthusiast from Northampton, who was just starting to build a 5 in. gauge LMS Duchess class locomotive, wanted to know whether ⅛ in. thick bright mild steel would be strong enough for the main and trailing frames. I think the answer is very definitely yes, provided that the frames are properly stayed, and cast hornblocks are used with adequate hornstays.

I remember overhauling a 7¼ in. gauge locomotive some time ago, and on examining it was amazed to find that the main frames were only 3/32 in. thick! Yet this locomotive had been running without trouble for at least ten years.

One gentleman, who was building a 3½ in. gauge *Rainhill*, wanted advice on the best type of regulator to use on this model. The boiler, it will be remembered, is a small one having a large steam dome set well to the rear.

A short disc-in-a-tube type would be very suitable, the steam collector being a length of tube about $\frac{3}{16}$ in. o.d. screwed into the main tube through the dome cover. This will ensure reasonably dry steam being admitted.

Another useful regulator is the simple screw-down valve type. The only snag to this design is the large amount of movement required on the regulator handle, to give a reasonable opening to steam. However, this can be offset to some extent by using as coarse a thread as possible, and by making the angle of the core as large as possible (90 deg. or over).

This type of regulator has one advantage—it does shut! On so many locomotives, using the more elaborate designs of regulator, there is that annoying leakage—small though it may be—when the handle is at "shut."

On valves

We were not at all surprised to receive, from more than one visitor, that hardy annual: piston valve or slide valve? This is really a very difficult one to answer as it depends so much on one's own workmanship and experience.

Of course, where cast iron is being used for the cylinders and proper rings to pistons and valves, the answer is undoubtedly piston valves. It is where gunmetal is used—as in most of the smaller gauge engines—that the query arises.

I should certainly not dispute that many excellent locomotives have been built using piston valves without rings in gunmetal cylinders. I feel, though, that most people would agree with me when I say that in this case piston valves *do* call for a higher degree of accuracy than slide valves, and also that they are more inclined to blow, after some wear has taken place, than the flat ones. Lubrication, too, must be watched very carefully.

Some interesting queries on boiler construction were received, particu-

larly from two model engineers who proposed building a 3½ in. gauge locomotive boiler entirely in stainless steel! The main problems that would be encountered when using this material would be the hanging of the plates, the actual brazing operations, and getting sufficient threads in the material for stays—not to mention the difficulty of obtaining the right sizes of tubes, etc.

I should add here that the two gentlemen concerned expressed themselves as confident to undertake all these processes. At all events it would be very interesting to have readers' views on the matter.

One visitor had had trouble with backhead fittings leaking when the boiler was under steam. The usual cause of this is excessive slackness in the thread of either the bush or the fitting or both.

If fairly fine threads are used that are reasonably close fitting, and plumber's jointing is spread over the threads before screwing home, no trouble should be experienced. Where the fitting has a flange of reasonable size, a Hallite washer may be used, which will make doubly sure.

Valve trouble was at the bottom of another enthusiast's tale of woe. He had built a gauge O high-pressure coal-fired locomotive, using the conventional slide-valve cylinders with valves on top and outside valve gear. The valves on this model appeared to leak badly at any position of the valve relative to the port face.

The most likely cause of this would be that the valves were not allowed a slight play in an up-and-down direction—in other words the valve spindles were pressing the valves hard down on the port faces. This nearly always leads to trouble. Alternatively, the valves themselves and/or the port faces were not quite flat.

That inside cylinder

One visitor had a very interesting problem. He had recently purchased a second-hand 3½ in. gauge LNER *Green Arrow* type locomotive. This model had the correct three cylinders and Gresley conjugated motion as in real practice, though the cylinders actually had slide valves.

The outside cylinders appeared to be satisfactory, but the inside cylinder was very definitely not. The trouble seemed to be that the inside valve was a great deal out of its correct position relative to the ports and to the position of the inside crankpin, and no amount of juggling with the position of the valve crosshead on its spindle effected a cure.

It will be recalled that on the full-size locomotive, the outside cylinders are slightly inclined but the inside cylinders are inclined at a further six degrees in order to clear the leading axle. As the cranks normally have to be set at 120 deg. to one another in order to provide correct valve functions on the inside valve, these six degrees have to taken into account, and the actual position of cranks would be 114 deg.—126 deg.—120 deg.

Thus there is a distinct possibility that the builder of this model had forgotten this relative inclination of the cylinders. If I am right I certainly don't envy the worthy gentleman having to shift those cranks!

A few queries were received on model power boat machinery. For instance, one visitor wanted advice on a suitable type of boiler and feed pump for a steam launch of 48 in. overall, powered by a ⅝ in. × ⅝ in. SA 2-cylinder engine.

Our suggestion was a centre-flue type boiler, all copper, and all brazed or silver soldered, size about 4 in. o.d. × 9 in. or 10 in. long, and fired by a paraffin or petrol blowlamp. The feed pump might be a straightforward horizontal type with ball valves, say ¼ in. bore × ⅜ in. stroke geared down 3 : 1, and fitted with an additional bypass for accurate adjustment.

Another gentleman wanted our opinion as to the most efficient power plant for a three to four foot launch to be used for radio control and experimental purposes.

Our suggestion here was a 12 v. d.c. electric motor, using a permanent magnet of Alcomax or similar alloy, and batteries of the Nife nickel chrome type.

To conclude, I hope that some at least of these suggestions have proved or will prove of use; on the other hand if anyone has been led astray—well, I can always have a shot gun hidden underneath our hot-air engine at the next Exhibition! ▣

16th century models

I am interested in sixteenth- and seventeenth-century sailing vessel models and would much appreciate it if you could give me some information on British firms that deal in such models and model-building materials. —H.H., Boden, Sweden.

▲ *The Keelbuild Model Aero Works, 18 Blenheim Street, Newcastle upon Tyne, supply a series of excellent kits of historical ships, the designs of which are based on reasonably authentic information. Modelcraft of Grosvenor Road, London, SW1, also supply similar kits. These are for small models 10 in. long or smaller. The kits, of course, comprise the necessary design and materials.*

A number of antique dealers can supply genuine historical models and replicas, the chief of these being The Parker Gallery, of 2 Albemarle Street, London, W1.

Magneto construction

I have constructed the Stuart Turner 30 c.c. petrol engine, but will be obliged if you would help me on the following:

1 What firms supply coils and magnets for the construction of a magneto to suit this engine?

2 Would a low-tension magneto supplying the current to energise a small spark coil be successful?—H.L., Rawtenstall, Lancs.

▲ 1 *The parts for constructing the Atomag miniature high-tension magneto were formerly supplied by Roox Products Ltd, Wellhouse Road, Beech, Alton, Hants., but it is not possible to state whether they are still available.*

2 *It is practical to use a low-tension magneto to supply current to a normal type of ignition coil, but it will be much less efficient in respect of the amount of electrical energy required than a high-tension magneto and, thus, it will have to have a relatively large output. This is particularly important when attempting to obtain an efficient spark at low revs or on starting.*

Test-boiler fittings

I am building LBSC's vertical quick-steaming testing boiler. The boiler is 5 in. dia. and 10 in. high, with 55 $\frac{5}{16}$ in. fire tubes and one 1 in. superheater flue.

I would appreciate information on the following:

1 Using the usual LBSC type blower-ring with three orifices, what size tube should be used, and what diameter should each orifice be?

2 For water delivery I intend to use a hand force pump. What size delivery pipe should be used for this?

3 I am thinking of using the boiler to steam a vertical engine, and would like to know to which of the Stuart Turner vertical engines the boiler would be best suited.—J.B.W., Sutton Coldfield, Warwicks.

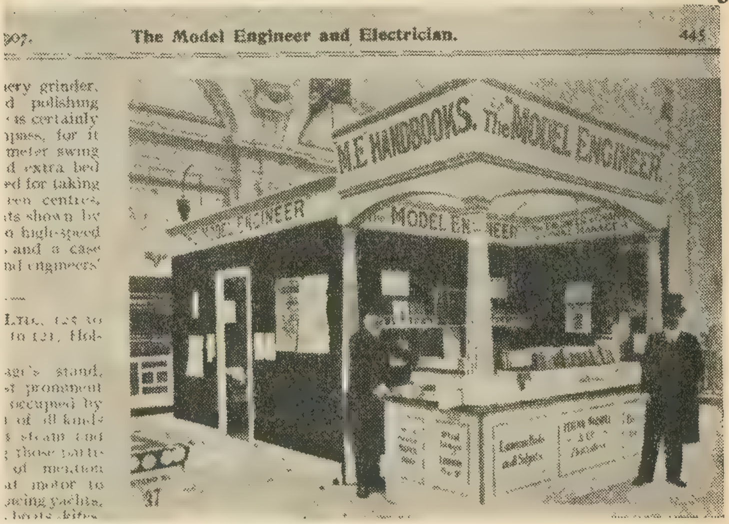
▲ 1 *The blower ring should be made of tube ⅛ in. dia. and the diameter of the orifices should be approximately 0.040 in. (No 60 drill) but this diameter is not very critical.*

2 *A ¼ in. delivery pipe should be suitable for the feed delivery of the hand pump.*

3 *The most suitable Stuart engine for your purpose would be the No 7a, 1 in. bore × 1 in. stroke, height 7½ in.*

50 years ago

That first Exhibition . . . what a wonderful show it was . . . the exhibits were many and widely varied . . . there were demonstrations and lectures galore . . . a speech by the great man himself . . . and, with the Herr Professor's Viennese Band in attendance, the crowds almost waltzed around!



The ME bookstall and reception room

NEVER has such a fine collection of models, such an excellent display of tools and materials, and such an interested and enthusiastic crowd of people been gathered together under one roof before. The Royal Horticultural Hall is itself a handsome building, but the tasteful stands and decorations, the beautiful engineering models, the snow-white sails of the graceful miniature yachts, and the brilliant lighting effects—all combined to make a show of infinite interest and beauty.

The doors were promptly opened at eleven o'clock on Tuesday morning, and the model engineering enthusiasts who had been patiently waiting without began to throng through the turnstiles. From then on till the closing hour on Saturday evening came one long stream of visitors from all parts of the country, and even from abroad.

There were those who had passed long years in successful engineering work of every kind, and those on whose apprenticeship indentures the ink was scarcely yet dry. There were amateurs who had made models by the dozen, and amateurs who had never seen a model other than their own.

Professors of engineering and other branches of applied science, naval and military officers, doctors, schoolmasters—and, indeed, people of every rank and calling—came, saw and admired. Those who knew what model engineering really meant went away with their approval more firmly established than before, while those who here made a first acquaintance with the model-maker's art were impressed beyond all expectation. In securing public appreciation and public recognition of the real quality and value of model engineering the Exhibition has, in fact, worked wonders.

The various exhibits were so numerous and so varied that it will be impossible for us to mention all in detail. . . .

● Having made this general survey of the first Model Engineer Exhibition, held in London from October 22 to October 26—exactly half a century ago—MODEL ENGINEER turned briskly to the trade stands.

Some people have complained that there were too many trade stands at the Jubilee Exhibition. They may, therefore, care to know that in 1907 the trade stands were considered of such importance and interest that the magazine, after the brief introduction which you have just read, devoted ten pages to the trade and concluded with a mere two pages on everything else.

There was no discussion of individual models as there is today. The Loan Section received a page and a half, the Society of Model Engineers (now SMEE) a paragraph of 22 lines, the Victoria Model Steamboat Club a similar paragraph, and the competition section a page with a large illustration of the SMEE track.

This article, the only survey of the Exhibition to appear, ended with a column on Lectures and Music.

The ME March

One of the many pieces played by the Herr Professor's Viennese Band—how Edwardian the Herr Professor and his musicians seem to us now!—was the Model Engineer March of which, perhaps, someone somewhere still has a copy. The band and the cinematograph shows (by Walter Tyler Ltd) provided entertainment for all.

The lectures were agreeably varied. Covering enough subjects for three men, Richard Kerr spoke on sound waves and voice forms, colour photography and microscopic wonders of nature. In his demonstrations of electrical and scientific apparatus—demonstrations which could have filled the rooms twice over—he was " ably assisted by his two charming daughters, whose really expert handling of scientific apparatus was a novel experience to the majority of the visitors."

Colour in 1907

One cannot help suspecting that " the majority of visitors " were rather

The 1907 *SMEE track*

more interested in the lecturer's charming daughters than in sound waves and the microscopic wonders of nature. The appeal of colour photography, however, can hardly have failed to be genuine.

Some readers may be surprised that colour was being used for pictures fifty years ago—but the fairly recent past, and especially the period from the last years of Victoria to the outbreak of war in 1914, is full of surprises for anyone who cares to study it. Nothing is as new as it seems: everything continues or recurs in different forms.

One of the trade attractions at this year's Exhibition was a toy gyroscope, skilfully demonstrated to the interest of young and old. In 1907 William J. Tennant, well known as a contributor to MODEL ENGINEER, discoursed on "Modern Applications of the Gyroscope," explaining its principles non-mathematically.

His audience, we learn, was delighted by "his ingenious and distinctly successful manipulation of the homely umbrella to illustrate the peculiar movements of the gyroscope when at work"; and one of those who watched him was Louis Brennan, inventor of the gyroscopic monorail locomotive.

Lesson for the teachers

Lecturing on "Electric Oscillations and Waves," R. P. Howgrave-Graham carried out experiments which were "startling in the extreme." We may wonder how many of these startling experiments foreshadowed discoveries whose use has since become important to us all.

The Model Engineer Exhibition opened, as an annual London event, in an age of experiment, and model engineers were eagerly to the fore. "We are glad to hear," wrote this journal, "that negotiations are pending for the sale of several inventions as a result of the Exhibition."

One visitor travelled 180 miles especially to hear the lectures. Of particular interest, and of particular relevance today, was J. G. Edwards' paper on "The Equipment of Workshops for the Teaching of Metal Work." Members of the National Association of Manual Training Teachers attended, and the chairman was C. W. Kimmins, chief inspector of Education to the LCC.

That evening, the first Model Engineer Exhibition—does anyone who reads these lines remember it?—drew to its happy close. The crowd called for Percival Marshall, the author of it all, as a first-night audience calls for a playwright. After he had spoken his thanks from the musicians' gallery there were ringing cheers—and then the Herr Professor swung his band into the strains of Auld Lang Syne. No doubt, like the others, he had admired the model of *Lusitania* on the Victoria stand; and like the others he may have remembered it eight years later, in a different world. ▣

MODERNISATION AT DUMFRIES

THE final stage of a permanent way and resignalling scheme designed to speed up the movement of traffic at Dumfries (situated on the former Glasgow and South Western route between Glasgow and Gretna Junction) has now been completed.

The technical departments had extensive renewal programmes in the area where the lines to Stranraer and Lockerbie join this route, and the work was co-ordinated throughout the various stages to bring into operation an improved layout with the provision of colour light signalling.

The scheme included the elimination of St Mary's and Dumfries Nos 1, 2, 3 and 4 signal boxes and the concentration of the work in two new signal boxes named Dumfries Station and Dumfries South. The former semaphore signals were replaced by colour light signals throughout the Dumfries area and complete track circuiting on the main running and bay platform lines in the area controlled by the new signal boxes was provided.

Conversion of the junction to the Lockerbie line from double to single track and the extension of the electric token working to Dumfries Station were also carried out.

The area of colour light signalling is approximately six route miles and comprises some 26 multi-unit colour light signals of the two, three or four aspect type and 16 position light shunt signals and seven sets of motor points.

The panel in the Station signal box comprises 96 individual switches mounted below an illuminated diagram, the groups of switches being located below the particular junction to which they apply.

Track circuits are of the conventional d.c. type, fed by transformer rectifier sets. ▣

POSTBAG

The Editor welcomes letters for these columns, but they must be brief. Photographs are invited which illustrate points of interest raised by the writer

IN PERSPECTIVE

SIR,—G. J. Gable [Postbag, September 5] submits details of a simple centre finder and says of the design which appeared recently under my name that he "really can't see that such elaboration is necessary."

This, of course, is fair comment on a subject of common interest. However, because I feel there might be a small matter of perspective involved, I would like to offer a further word or two which might be relevant to most gadgets of this class.

From a very superficial examination of the design submitted by Mr Gable it will be apparent that the pointer merely reproduces the eccentricity of the "dimple," the *maximum* amount of the error being shown at the pointer in direct contact with the work. But how does one proceed to decide the final condition of "no movement at the point"? Obviously by tactical or visual means.

Now, if one can feel happy with the standard of accuracy thus attained surely a further simplification becomes possible—such as merely holding the point of a centre punch in the dimple, or as advocated in the aforesaid article, using the dead centre as a reference.

I am prepared to believe that there are those among us who can detect by sight or feel the magnitude and sense of those last few errant thou which make the difference between "near enough" and "spot on," but, I for one, am not of that gifted minority.

One of the inherent qualities of the conventional type of wobbler is that it *multiplies* the error in the ratio of the arm lengths of the points and, therefore, the degree of precision achieved by its use as compared with that of the simplified type must be in that same ratio.

As regards wear, I suggest that the lathe bearings might become "gey shoggly" by the time the pins in the "elaborate" type are worn out!

Burghead. J. NIXON.

HOMEWORK

SIR,—I have a well-equipped home workshop and I find my lathe invaluable for many repair jobs, particularly on the car. I think, however, that it, and the other machines, could very profitably be employed in making some worth-while things for the home, such as a sewing machine or washing machine, but articles on these subjects seem frowned on in MODEL ENGINEER.

This seems to me a great pity, for I am sure that your technicians would provide some first-class articles and drawings, far in advance of the quality of article found in the magazines devoted to home hobbies.

I find it difficult to understand why model engineers do not, on the whole, make more useful pieces of home equipment and apparatus than they do, for they would save a tremendous amount of money which could be ploughed back into their hobby.

I am beginning to wonder whether most of them don't feel as I do, but have refrained from saying so lest they receive an editorial censure. As a lone wolf, I am a bit out of touch with what others think, but I can't help feeling that there must be many who would welcome a blueprint for a lawnmower, vacuum cleaner or even a spin drier.

Newport. JAMES MELTON.

We are certainly willing to consider such articles if the point of view of Mr Melton receives support from other readers. ME staff writers are fully committed at the present time but we should be glad to consider constructional articles from model engineers, with the usual provision that they conform with our technical standards.—EDITOR.

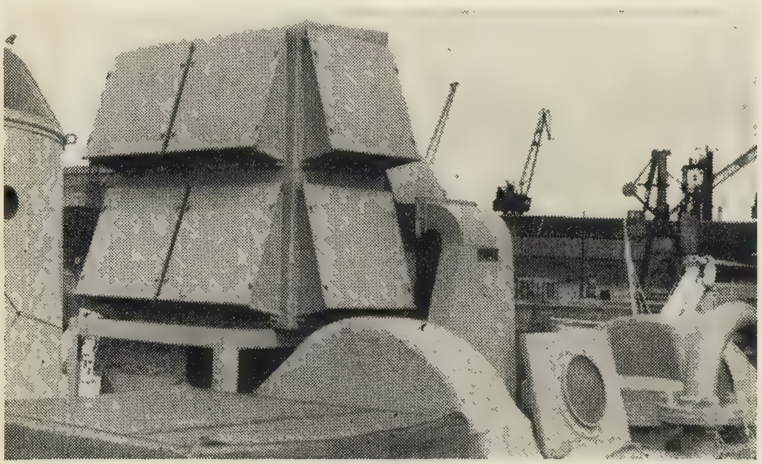
MORE ABOUT ST NINIAN

SIR,—Since making the drawing of the Pleno ventilating unit on *St Ninian*, which was published in the concluding instalment of this series [October 17], I have received some further photographs from Capt. Thomson, of Edinburgh.

One of these shows very clearly the air filter intake, from which it appears to be wider than that shown on my drawing. I estimate that it is approximately 4 ft 6 in. wide. It will be noticed that there are four openings on the starboard side instead of the two shown on the drawing.

The photograph shows also other interesting features. The two panels in the sloping top of the rectangular casing, which are shown open, appear to have glazed portholes in them.

New Malden, Surrey. E. BOWNESS.



Air shaft; the aftermost one. View looking obliquely across St Ninian from bow of No 1 lifeboat. Note forward side of funnel on extreme left of picture

SCALE TIME

SIR,—At the end of the Smoke Ring "Timber!" [September 26] I was surprised to read the following: ". . . no doubt in the scale-time equivalent of 28 minutes!".

Time is a constant, surely? Consider a model locomotive with scale driving wheels of 7 ft dia. which are revolving at 240 r.p.m. Assuming there to be no slip and r.p.m. remain

constant, then in one minute the engine will cover one mile to the same scale as itself whatever that scale may be.

Perhaps other readers may care to express their views. I say this because I once visited an O gauge model railway and was intrigued to find a clock whose gear train had been altered so that it registered scale time in connection with the running of the trains.

Guiseley, Leeds. G. H. BUTLAND.

PRECEDENT

SIR,—J. N. Maskelyne, in his review of the locomotives at the Model Engineer Exhibition [September 19], criticises the design of Mervyn Vest's 4-4-4T on the ground that the coupled wheelbase is too short. However, there is a distinguished precedent for Mr Vest's arrangement. The Northern Railway of France built 75 4-4-4T locomotives between 1901 and 1906 with a coupled wheelbase of 5 ft 10 in. as against an overall length of 35 ft 9 in. The total weight of the engines was 63½ tons, and they had outside cylinders.

I have seen many of them since the war, and ridden behind them, and their riding at speed as seen from the first coach seemed quite normal; probably because of the high proportion of weight borne by the bogies.

A comparison between these French engines and Mr Vest's model cannot be carried too far, however, because the model clearly represents a main line engine with a weight of 80 tons at least, whereas the French engine was designed for sinuous branch lines with severe weight limitations. Like all the designs of M. du Bousquet, these engines were eminently successful, but I have never found out which of their characteristics earned them the nickname of "revolvers."

London, N2. J. T. VAN RIEMSDIJK.

FORGOTTEN PIONEERS

SIR,—While in York recently I paid my usual visit to the Large Exhibit Museum. Since my last visit the display has been altered and quite a lot of new acquisitions have been added. Around the walls a series of large cards has been placed, each card bearing a portrait and brief details of the life of different individuals who have made decisive contributions to the railway system.

Among these names was Samuel Waite Johnson, who was born in Bramley, near Leeds, in 1831 and died in Nottingham in 1912. I have lived in Bramley for over twenty years, yet I have never heard mention of this man. I would be most grateful if any reader could give me information regarding his career.

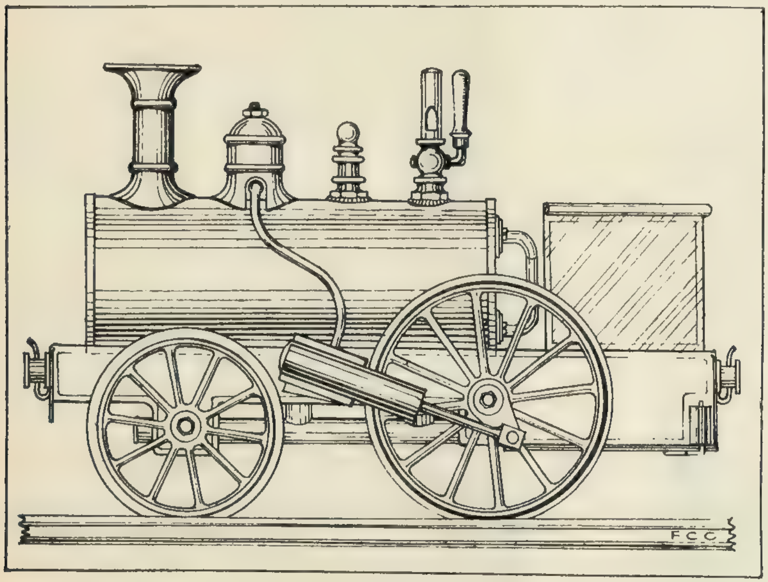
It seems that Johnson may have dropped into oblivion in a similar manner to that other gifted Leeds engineer, Matthew Murray. An abortive attempt was made to bring his endeavours to public notice while I was at school but after putting up two or three wall plaques on buildings with which he had associations he was relegated to limbo. This is really a great pity because I understand that the line he constructed between the Middleton Colliery and Belle Isle, on the outskirts of the industrial part of Leeds, was the first steam-powered railway in the world, being built earlier than the famous Stockton and Darlington passenger carrying service.

Before the last war Leeds Museum had a piece of Murray's original cast-iron rail on exhibition. It was of rack type with pegs cast on the side to engage with the driving gears fitted on the locomotive. Since the war this item has not been on view and I suspect that it was an innocent victim to the HE which landed on the front part of the museum during a raid.

I have taken ME for quite a while now, and I would like to congratulate you on a really fine piece of journalism. The way you handle a technical subject and still keep it from going dry is a work of art.

Though you constantly print details of fittings for various lathes I have yet to see any mention of the 3⅜ in. Zyto, made by Tyzack. As this is a popular inexpensive machine I feel confident that a large number of your readers would welcome any information you may give.

NELSON H. A. MORETON.



Side elevation of Mr Coxon's 3 *in. gauge steam engine*

ANOTHER VINTAGE LOCO

SIR,—Following an item [Postbag, July 18] by G. H. W. Randell, of Leigh-on-Sea, Essex, here is a picture of my first steam engine, presented to me in 1903 at neighbouring Westcliff. The illustration has been made from a schoolboy sketch of mine which seems to be proportionally correct.

Similar to Mr Randell's model, the engine, having inclined oscillating cylinders and spirit-fired brass boiler, ran on 8 ft circular track of 3 in. gauge. The frame was of heavy-gauge tinplate with coal bunker of sheet copper. The red-spoked brass wheels were exceptionally well finished, and the array of polished brass turnery along the boiler top dazzled the eye! In addition, she sported a useful glass water-gauge.

With safety-valve lifting she tore around at increasing speed until one had to stop her and blow a long blast on the whistle to ease the pressure, otherwise she would jump the rails.

After the Kaiser's war I got her under steam again for the benefit of a little boy, and—despite years of retirement—she hared around as of old, blowing-off gallantly. I don't think she was "DRGM," but whoever built her turned out a jolly good performer.

Oxford. F. C. COXON.

POSTBAG : . .

A RECORD ?

SIR,—I should like to thank LBSC for his comments on my vintage locomotive. He will probably remember my $\frac{3}{4}$ in. scale *Flying Scotsman*, the chassis of which was made by Mr Rowe, of Welwyn. I think I can claim a near record with this, it having carried about 200,000 passengers during its 30 years of service. The coupling and connecting rods show no sign of wear.

The suggestion that my ancient locomotive has had a collision which caused the bent frame is not strictly true because it hasn't been involved in a collision; even if it had its "five fly power" could not have had enough force behind it to do that !

I think that since it is a cast frame the excess heat from the spirit burner has warped the frame.

Leigh-on-Sea, Essex. G. H. W. RANDELL.

SPITFIRE

SIR,—Mr Murdock [Postbag, September 19] seems to have got all at sea with his facts regarding the Mk II Spitfire.

The Type 329 Spitfire II followed the Mk I into production in 1940 and became the first production variant to be produced at the Castle Bromwich "shadow" factory. The Mk II Spitfire was powered by a 1,175 h.p. Rolls-Royce Merlin XII engine driving a Rotol three-blade airscrew.

There were two forms of armament: the Mk IIA had eight 0.303 Browning machine guns with 300 rounds of ammunition per gun; the Mk IIB had two 20 mm. cannon and four 0.303 Browning machine guns. The mark designation A and B referred specifically to the armament arrangement in the wing. Over 900 Mk II Spitfires were built including 170 Mk IIBs. The Mk II Spitfire was never used as a photographic reconnaissance aircraft, the first variant doing this being the PR Mk IV.

I quote these facts from the book *Famous Fighters of the Second World War* by William Green, who is acknowledged to be an expert on aircraft produced in those years. Also there are many wartime recognition books containing this information.

York. B. SLATER.

SIR,—What rubbish for Mr Murdock to state that the Mk II Spitfire was unarmed and then have the audacity to claim this superb fighting machine as a recce aircraft.

The first Mk II was a modified Mk I No K9788. Mk IIs were built in two versions: Mk II A/750 powered by a 1,175 h.p. Merlin XII (replacing the Merlin II or III) armed with eight machine guns. Then the Mk II B/170, armed with four 0.303s, plus two 20 mm. canons. Most Mk IIs were eventually converted to Mk V standard.

The Mk II Spitfire entered squadrons late in 1940. Early offensive sweeps over Europe (known as Rhubarbs) were made by Mk IIs of No 66 Squadron, Biggin Hill, on 20 December 1940. The first photo-recce machine was a Mk I fitted with an f.32 camera first used over Aachen on 18 November 1939.

It was not until April 1940 that a standard photo-recce Spitfire, the PR IV, was used; 229 of them were built. Spitfire Mk IICs were used by Air Sea Rescue units. The PR IV used a Merlin 46 or later engine and an f.52 camera.

So, please, Mr Murdock, if you are irritated, scratch around for the right gen, then write about it ! My model *was* a Mk II !

Luton, Beds. ROGER P. NOLAN (ex RAF).

PICKLING CASTINGS

SIR,—Duplex states ["Workshop shaping machine," August 22] that the pickling of iron castings is not necessary if a carbide-tipped tool is used. I should like to point out, however, that unless the clapper box has an automatic lift or is lifted on the return stroke a carbide-tipped tool will chip.

Orpington, Kent. D. R. THORNE.

AVOID THAT BANG

SIR,—With regard to E. F. Gough's letter [Postbag, August 22] concerning the use of a vacuum cleaner for supplying air to a gas torch. I should like to recount the following experience which I had with a similar set-up.

I turned on the gas, lit it, and half a minute later switched on the vacuum cleaner. The result was a severe explosion. The spring clips retaining the dust bag were blown off thereby preventing even more serious damage.

On giving the matter some thought I realised that the gas had travelled back down the air line into the cleaner, forming an explosive mixture, and on switching on the cleaner the sparks from the motor brushes had ignited the gas.

If anyone uses a cleaner might I suggest that the machine is switched on first, then the gas ?

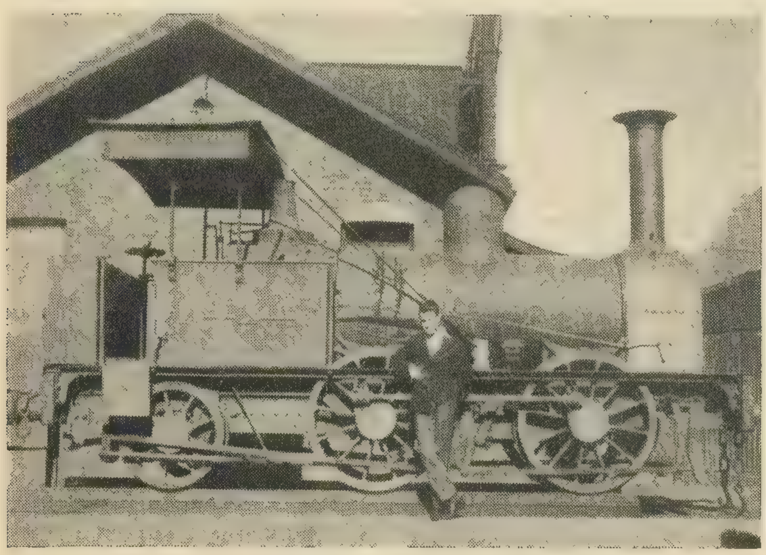
Birmingham. M. G. D. SKELDING.

FIRST IN THE CAPE

SIR,—I read with interest the article on the old Hawthorn locomotive at Leigh, Lancashire, by my friend J. H. Farr, of Edinburgh [ME, September 5].

I see that he refers to the first locomotive of the South African Railways, now preserved at Cape Town station. I enclose a photograph supplied to me by the South African Railways, taken before it was placed in that station, of the other Hawthorn veteran. Of course, the South African Railways were originally of 4 ft $8\frac{1}{2}$ in. gauge and this relic is of that gauge.

W. LOCH KIDSTON.



The first locomotive to run in Cape Province

ON JUDGING

SIR,—Mr Higgs' reasoning [Postbag, August 29] on the relative merits of true scale and freelance models seems to me to be a classic example of drawing completely false deductions from untenable premises.

On the North London Model Association's stand at the ME Exhibition was Mr Tucker's freelance Garratt locomotive, a past Championship Cup winner. Can Mr Higgs really delude himself that there is anything whatever about this truly magnificent piece of work that shows evidence of Mr Tucker's "limitations as a craftsman"?

Some of the finest examples of craftsmanship ever shown at past ME Exhibitions have been freelance designs. As instances which spring instantly to mind are: Commander Barker's first three marine engines—the side lever paddle engine, the horizontal screw engine and the oscillating paddle engine; Mr Cecil Fox's 4-6-4 tank locomotive (illustrated on the cover of your issue for May 20 and a runner-up to Mr Tucker's Garratt); Willoughby Bros' *Peter*. These are outstanding examples of craftsmanship and design.

In my experience equipment limitations have little or nothing to do with the quality of the end product. While comprehensive equipment is of great assistance to rapid working, its absence rarely, if ever, handicaps the true model engineer in turning out first class work.

One would naturally assume that "ability to design" is to the credit of its possessor and as such should be entitled to a higher award than can be attained by the copyist.

For years now the tendency in this country has been more and more for people to get their thinking done for them, a tendency that has been quite noticeable in the model engineering world.

Obviously it is not given to all, or even the majority of, model engineers, to evolve their own designs, but the man who has the ability to evolve an efficient design and to bring it to fruition is a more accomplished all-rounder than is the copyist, and as such is fully entitled to additional award for his additional ability.

The suggestion that the freelance designer produces his designs "... to obviate the problems which the prototype modeller must face when faithfully reproducing in miniature all the known details despite the limitations listed" (what limitations and where listed?) "and especially in the case of working models" strikes me as being a piece of verbose and unrealistic jargon, quite at variance with easily ascertainable fact.

Nobody suggests that the judging system is perfect, much less that mistakes are never made under it, but over the years in the hands of competent judges it has amply demonstrated its essential soundness and nobody, so far, has produced a better one.

The only facet of model engineering which can definitely claim to have influenced full-size practice is model yacht building, which has always been notable for freelance designing as opposed to copying full-size prototypes. There is far too little original thinking among the majority of model engineers, and every endeavour should be made to encourage such thinking and to offer incentives for it.

Rustington, Sussex. K. N. HARRIS.

GAS ENGINE . . .

Continued from page 570

quite well and enables a sound joint to be made. Alternative materials for the needle are phosphor bronze or German silver—not ordinary brass.

A check spring should be attached to the carburettor body to prevent inadvertent movement of the needle control when once set. This may be held in place by a screw tapped into the body (see general arrangement drawing) or shaped so that it can be clamped under the shoulder of the needle guide.

If it is desired to provide for priming the carburettor for starting from cold a hole may be drilled in the throttle cover, and a little shutter plate (secured by a screw or rivet) may be arranged to slide over and close it to prevent air leaks when not in use.

● *To be continued*

NEWBURY . . .

continued from page 567

In the case of the tender axles, the journals should be brought down to 5/32 in. dia. and lightly polished after turning. The tender wheels may be pressed home on their axles at this stage, using the lathe to ensure their going on true.

The locomotive axles may with advantage have small centre holes drilled in their ends, this being done while still in the three-jaw.

BOGIE

The bogie sideframes are cut from $\frac{3}{4}$ in. × $\frac{1}{16}$ in. flat bright mild steel. They are held at the correct distance apart by a central stretcher, which may be a casting or bent up from $\frac{1}{16}$ in. b.m.s. plate, and by two $\frac{1}{8}$ in. dia. round stretchers which are held in place by 10 BA countersunk steel screws.

The axleboxes are exactly similar to the main boxes except that $\frac{3}{8}$ in. square brass bar is used instead of $\frac{1}{2}$ in., and no spring pins are used. The springing consists of three strips of 0.015 in. hard phosphor-bronze on each side, held in place by one 8 BA screw; the ends of the longest (and lowest) strip should be bent downwards slightly so as to engage exactly in the middle of the axleboxes.

The bogie centre pin, turned from b.m.s., is threaded 6 BA for screwing into the middle of the cylinder casting,

Crankpins are turned from $\frac{1}{8}$ in. dia. silver-steel rod held in the three-jaw, the thread for retaining nuts being made 7 BA. It is advisable to ease the ends of the crankpins slightly where they enter the wheel, otherwise there is always the danger of cracking the wheel bosses when pressing the pins home.

Put a nut on the crankpins before pressing in, to protect the thread.

COUPLING RODS

These are cut from $\frac{3}{8}$ in. × $\frac{1}{8}$ in. b.m.s. I cut mine entirely by hand, though anyone fortunate enough to possess a horizontal milling machine will make short work of them, clamping them together in the machine vice and using a small diameter cutter. However, the important thing is to get the rods the right length!

My usual way is to use a large pair of dividers and set these, not from the axle centres, but from the edge of the axle (it is easier to see when you are "spot on" this way).

Having marked out one rod, the holes are drilled $\frac{1}{8}$ in. and the second rod clamped to the first with 5 BA screws.

If hand filing, it is easiest to file the top and bottom edges first, then shape the bosses and oilboxes, either by filing, or by swinging the rods individually about a $\frac{1}{8}$ in. dia. peg on the end of a piece of square steel and feeding into an end mill in the chuck.

My intention is to use the coupling rods for quartering the wheels, but those who prefer to use other methods of quartering can open out the holes with a No 29 drill ready for case-hardening.

Don't case-harden until the wheels and axles are assembled and running freely—just in case!

● *To be continued*

CLUB NEWS

Edited by
THE CLUBMAN

DESPITE the temptations of STV, model engineers in Scotland—or those worthy of the name—are remaining loyal to their old love. The Scottish Model Engineering Exhibition, to be opened in Glasgow by the Lord Provost the day after tomorrow provides the highpoint in a year of activity.

Interesting new models are continually being built. At Falkirk track day two in particular commanded attention: a freelance 5 in. gauge 2-6-4 LMS tank and a $3\frac{1}{2}$ in. *Netta*, both of which ran well. An impressive performance is now expected from the Glasgow and South Western Manson 4-6-0 in 5 in. gauge by Alfred Watts, who has recently been ill.

Experience with 5 in. bogie cars at the Schoolboys' Exhibition, in the Kelvin Hall, has convinced **Glasgow SME** that $7\frac{1}{4}$ in. gauge is the best minimum for serious work at exhibitions where the passengers are boys and girls.

Its own portable track

The society is to build its own portable track in 10 ft sections of $1\frac{1}{2}$ in. $\times$ $\frac{3}{8}$ in. strip steel and the gauges will be $7\frac{1}{4}$, 5 and $3\frac{1}{2}$. Drawings have already been prepared and approved, and the track should be ready for the Kelvin Hall in March.

This work is now being pleasantly interrupted by the Scottish Model Engineering Exhibition at the Christian Institute—October 26 to November 2. About 200 entries are expected for the show, which may in future be held in the Kelvin Hall as part of the Schoolboys' and Schoolgirls' Exhibition.

The opening by the Lord Provost expresses the civic recognition that model engineering amply deserves in Glasgow.

LIP SERVICE NOT ENOUGH

The future of model engineering depends on encouraging young people to joint the societies. So stressed Mr C. E. Waller, Editor-in-chief of MODEL ENGINEER, when he proposed the toast to the Society of Model and Experimental Engineers at their annual dinner at the Piccadilly Hotel, London.

Looking to the future with some apprehension, he said that television and what were described as "push-button attractions" had been blamed for diverting the attentions of the young.

It was important to encourage young members; paying lip service was not enough and it was with great concern that he watched the efforts of the model engineer societies to attract younger people. Craftsmanship was not dead in youngsters but it was dormant; it needed to be awakened and encouraged.

The Earl of Northesk, president of the society, who was in the chair, replied to the toast and developed the theme of expansion, saying that he was glad that the SMEE had opened its ranks to women. Already it boasted one woman member, Miss Ann Carter.

Paying tribute to the ability of Ann, whose overall-clad figure frequently graces the SMEE passenger-carrying track, Lord Northesk told of an occasion when he visited the Talyllyn Railway, of which he is chairman, and took over firing duties on No 4 from Miss Carter. He found the safety-valve lifting to a fine head of steam and the footplate immaculately swept.

Discussing the facilities which existed at the society's workshop he thought that members did not avail themselves sufficiently of this service. The stewards, he said, were always ready to help solve problems which arose in model engineering, and not only would they give advice in the making of a component but also with the operation of a machine.

Mr John Latta, in proposing the toast to the ladies, drew several chuckles with his humorous references to the "model engineer widow," but, he pointed out, the model engineer husband was quite an asset, for if he were spoken to nicely he could usually be prevailed upon to diagnose and repair the faults in all manner of things from mincing machines to refrigerators.

That swarf!

Replying, Mrs Joan Weston brought up another sore point which troubled model engineers' wives—swarf in the carpet. The first indication one had of its presence was the complaining "ping" from the vacuum cleaner!

Among the guests were Mr Saunderson and Mr Hildersley, who were among the first members when the SMEE was founded in 1898.

Mr Saunderson, who was the society's first secretary, maintained that in his day things were much more simple, models especially so.

No doubt somewhere today someone was making a model of an atomic power station and he would very much like to meet that person—at a distance! He thought that model engineering would go on to things far beyond his comprehension and often, he added drily, beyond the comprehension of model engineers of the present generation.

Warm thanks were expressed to Mr S. L. Sheppard, the secretary, for the able way in which he conducted the society's affairs and for his work in arranging the dinner.

Mr Y. M. Mezenin, the interpreter who was with the Russian delegation to this year's Model Engineer Exhibition, was a guest, and he promised to convey the greetings of the society to model engineers in the Soviet Union. ■

ME DIARY

October 25 Thames Shiplovers film show by David R. MacGregor: *Sorlandet*, *Mayflower II*, Thames barge; Baltic Exchange, London, 6.30 p.m.

October 26 Scottish Model Engineering Exhibition. Christian Institute, 70 Bothwell Street, Glasgow, 10 a.m. to 10 p.m. (October 27-November 2, 11 a.m. to 10 p.m.).

Bristol SMC "Ships in Miniature," Bristol Museum and Art Gallery, last day.

Institution of Engineering Designers, visit to Huwood Mining Machinery Ltd 9.30 a.m.

JE paper on Rubber, F. Shelton, 7 p.m.

October 30 Birmingham SME lecture by H. Chase of Birmingham MRC.

North London SME miniature railway section, HQ, 8 p.m.

JE visit to Yardley factory, Carpenters Road, London, E15, 2.15 p.m.

November 1 Malden SME firework night.

North London SME general meeting and jumble sale, E.R. Gas Offices, New Barnet, Herts, 8 p.m.

November 2 Bristol SMEE "What is Your Story?" Folk House, College Green, 7.30 p.m.

November 3 MRCA Bournemouth, National Championship, open, Bournemouth MCC, 29 Ashley Road, Boscombe, Hants.

November 7 Eltham and District LS, *Petrolea* by G. Sheed, Beehive, 8 p.m.

November 8 Shrewsbury and District SMEE biennial exhibition, Technical College, Shrewsbury, 7 p.m. November 9, 2.30 p.m.

Malden SME, Bits and Pieces.

Thames Shiplovers, building *Cutty Sark* model, H. G. Harrison, Oddi's Restaurant, Coptre Street, London, WC2, 7 p.m.

November 9 Acton MES first exhibition, Baptist Church Hall, Church Road, Acton, London, W3, 11 a.m.-8 p.m.

Model Engineer

Classified Advertisements together with remittance should be sent to Model Engineer, 19/20, Noel Street, London, W.1, by latest Thursday morning prior to date of publication. Advertisements will be accepted from recognised sources by telephone. GERRARD 8811. Ex. 4

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WORKSHOP EQUIPMENT

Buck & Ryan for Lathes and Workshop Accessories, drilling machines, grinders, electric tools, surface plates, etc.—310-312, Euston Road, London, N.W.1. Phone: Euston 4661.

Pittler B2 Lathe, treadle, stand, 22 collets, three s.c. chucks, independent chuck, drill chuck, faceplates, dividing head, screwcutting. Incomplete castings to complete overhead drive, excellent condition, £50. Starrett 12" Vernier gauge, new, £7 10s. 4½" × 36" wood-turning lathe, treadle, stand, slide and tee rests, £10. Evenings.—SWANNELL, 54, Corney Road, Chiswick, London, W.4.

"E.W." 2½" × 10" Convertible Lathe. We can now arrange delivery of this much sought after lathe. All accessories from stock. S.A.E. lists and illustrated leaflet.—WANSTEAD SUPPLY Co., 30, The Broadway, Woodford Green, Essex.

Immediate Delivery from Stock, Myford "ML7" and "Super 7" lathes, Super Adept lathes, bench planers, shapers, electric motors, small tools.—F. W. KUBACH, 12, Sylvan Road, London, S.E.19. LIV 3311-12.

CHARLES PORTASS & SON
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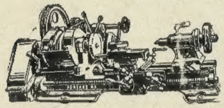

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Motors Tools

B.O.G. Alda Welding Set model B, complete. Also cutting outfit. Offers—Box No. 8662, MODEL ENGINEER Offices.

Bridges Home Workshop, many extras, as new, cost £34, accept £26 o.n.o.—HESLIN, 143, Ramillies Road Sidcup, Kent.

Myford ML7 Lathe, suds pump, solid bench, milling attachments, chucks, many other extras, £75 o.n.o.—Kandelglow, Forest Road, Binfield, Berks. Bracknell 1365 evenings.

Wanted. Vernier height gauge. Offers to—P. R. BLACKSHAW, 58, Blakelow Road, Macclesfield, Cheshire.

Two ½" Herbert die heads, eleven sets chasers, one ⅜"/¾" Wakstrom roller chuck, one ½" Weardon capstan chuck. All as new. Offers wanted whole or part.—A. MCELROY, 375, Purley Way, Croydon.

Small National Gas Engine in good mechanical condition, suitable for driving workshop. Property of Birmingham S.M.E., £10 o.n.o. Apply—EDWIN LOWE LTD., 59, New Street, Aston, Birmingham, 6.

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